AMERICAN

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Underlying modern research is the realization of vast latent values in nature. Although the lone genius does from time to time bring to light some part of these hidden values, only organized scientific research can assure the thorough exploration that will render the full measure of use for human welfare.

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The Bell Telephone Laboratories has now concentrated its efforts on communication systems and equipment for the armed forces. When the war is over its researches in communication will again be applied to an ever-improving telephone service in America.

BELL TELEPHONE SYSTEM

AMERICAN FORESTS

VOLUME 50 FEBRUARY, 1944 NUMBER 2

Editor
OVID BUTLER

Associate Editors
LILIAN CROMELIN ERLE KAUFFMAN

CONTENTS

American Forests

Published monthly by

THE
AMERICAN FORESTRY
ASSOCIATION

919 Seventeenth Street
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The American Forestry Association, founded in 1875, is a citizens' organization for the advancement of intelligent management and use of the country's forests and related resources of soil, water, wildlife and outdoor recreation.

Its educational activities seek to bring about a better appreciation and handling of these resources, whether publicly or privately owned, that they may contribute permanently to the welfare of the nation and its people.

In addition to publication of its magazine—AMERICAN FORESTS—designed to keep before the people of the country important conservation questions and issues, the Association carries on educational work in various fields including forest fire prevention, reforestation, protection of wildlife, prevention of soil erosion, preservation of wilderness areas, establishment of national forests and parks, advancement of forestry by private endeavor, the teaching of conservation in schools and the promotion of research in timber growing and forest utilization.

The Association is independent and non-commercial, and has no connection with any federal or state governments. Its resources and income are devoted to the advancement of conservation in the interests of public welfare, and all citizens are welcomed to membership.

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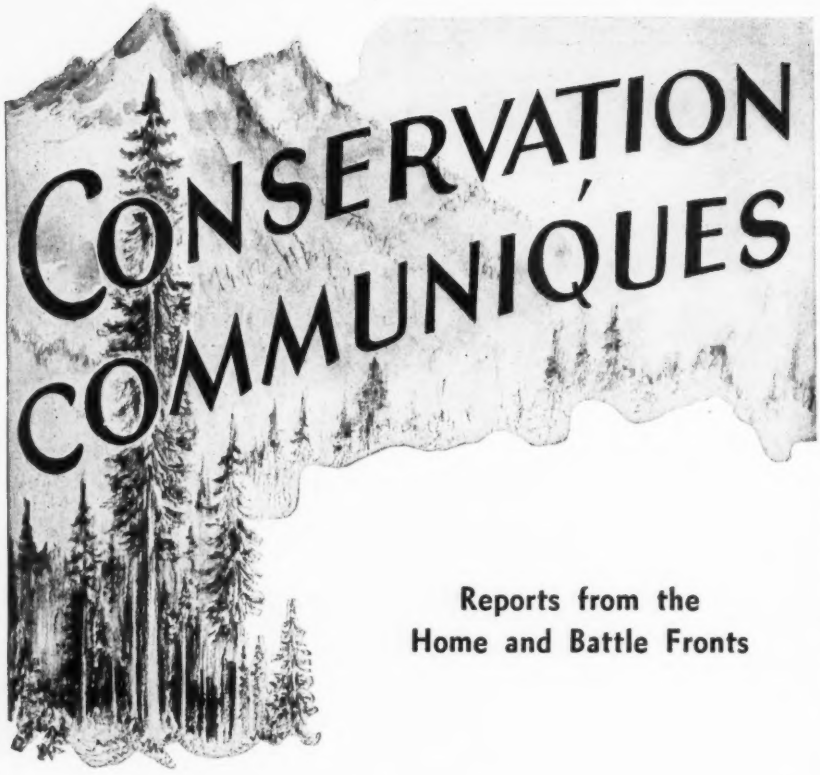


CONSERVATION COMMUNIQUÉS

Reports from the Home and Battle Fronts

Production of 14,000,000 cords of domestic pulpwood, 1,000,000 more than in 1943, will be necessary this year to supply expanded needs for paper and pulp products of our armed forces overseas and for essential home front requirements, the WPB has announced. A major part of the additional pulpwood is needed for packaging.

• • • •

Tea is unobtainable in occupied Belgium, so the German-controlled newspapers propose to their readers the following substitutes: common briar, some other species of briar, hawthorn, clover, Aaron's rod, Jupiter's bead and prickly willow-herb. Without sugar, no doubt.

• • • •

An outstanding contribution to the Allied war effort is the completion of the strategic 522-mile Ocean-to-Amazon Highway which now connects Peru's Pacific coast ports with the upper Amazon Valley, today the western world's source of rubber, barbasco and other strategic materials.

• • • •

A goal of 1,000,000,000 feet of lumber has been fixed as Canada's quota for export to the United Kingdom, according to the Canadian Timber Controller. At the same time it was announced that because of a slight improvement in the lumber situation in British Columbia, priority timber yards have been advised that stocks may be released without approval of the Controller.

• • • •

The foreign press now reports that wooden bicycle tires are being made in France. The inventor, it seems, does not claim the tires have the same road-holding qualities as rubber, but prospective purchasers are assured that they can be used with a "reasonable degree of safety in a country where traffic has become nonexistent."

• • • •

Norway and Sweden report a great reduction in the production of fur-bearing animals, chiefly because of feed shortages. Before the war more than 5,000 fur farms employed 6,000 persons in Sweden. Now there are less than 3,000 and most of these are run in conjunction with agriculture. Norway, which in prewar years was the world's greatest producer of silver fox, contributed only 60,000 skins last year.

• • • •

But there is no decrease in wolves. A report from Stockholm states that the number of wolves, particularly in the Namdalen district, has increased to such an extent during the past few years that they have become a nuisance—and danger. The reason for this is that no one has been allowed to possess weapons. Now, it is reported, the Gestapo intends to arm part of the population in order that they may defend themselves and their flocks against the wolf packs. Needless to say, the wolf hunters will be closely controlled by the Gestapo.

• • • •

An Ontario forest patrol and fire-fighting boat, using a gas producer, operated for a period of fifty hours on sawdust without ill effects to the machinery, it is reported. Consumption of sawdust averaged from one to three bags an hour, depending upon the speed at which the motor was run, whereas the boat previously had burned three gallons of gasoline an hour. The test was one of a series recently made by Ontario's Provincial Department of Lands and Forests.

• • • •

The Army's plan to build a series of dams across the Potomac River, one just at the edge of Washington, has encountered the opposition of scientists. One reason, voiced by the Biological Society of Washington, is that the impounded waters would drown out the best nature preserve and recreation area in the vicinity of the National Capital. But the main objection was that the dams would constitute a military menace. Calling attention to the devastation wrought in the Ruhr Valley by the blasting of the Moehne and Eder dams last May, the society said a flood resulting from bombing of such dams on the Potomac would cover the White House, Navy Yard and Army and Navy airfields located near the city. The dams were proposed primarily for the development of hydro-electric power and water conservation.

• • • •

General Claire L. Chennault, hero of the Flying Tigers, is now a game warden. Asked if he would consider running for governor of his native Louisiana, the general, an enthusiastic hunter, replied that the only office to which he aspired was that of game warden. As a result, the State Department of Conservation has mailed to Chunking a commission and badge making the general a full-fledged game warden in his native Tensas Parish.

TODAY WE FIGHT, TOMORROW . . .

TODAY, over Germany, at Cassino, on New Guinea, in Burma, all over the world, America fights. Tomorrow . . . .

"Tomorrow," wrote an ancient philosopher, "is only a vision"—but it is a vision of hope and opportunity if today we prepare well for it. Today America fights, with one heart and one purpose. Tomorrow, when the world is restored to freedom and to peace, America, the people of America, must rebuild.

Every person can find a way to help—every group, every institution, every industry. The American Forestry Association, in the dawn of a new year, is already looking and working toward tomorrow. Its Forest Resource Appraisal, announced in the January issue, is now in operation, moving forward. It is a project initiated and voluntarily being financed by the people of the country—for their forests of tomorrow.

"Please find enclosed my check for $100 for the Forest Appraisal Project of The American Forestry Association. This project meets with my hearty approval, not only for the project as such, but also for the fact that the Association undertakes it of its own accord and can thus work free of possible political interference."

Here, in a few words, a Minnesota citizen puts his finger squarely on the true value to the people of the country of The American Forestry Association. Since its organization in 1875, it has been an instrumentality of the people to work for the intelligent management and wise use of their forest resources. As an organization of citizens, it is independent, in no way connected with or influenced by either federal or state governments. Its resources and income, contributed by the people, are devoted exclusively to the public welfare.

Thus is the Association in a position to carry on this fact-finding survey to determine the effects of war upon the nation's forest resources entirely uninfluenced. And this it will do, staunchly backed by public confidence.

In 1925, when the Association was fifty years old, a prominent educator wrote these words: "The national movement of forestry began with the establishment of The American Forestry Association." Today, with victory as our goal, with the greatest conservation job in all history on the horizon, The American Forestry Association is ready, just as it was in 1875, to safeguard the people's interest in their forest resource. Today we fight—and plan. Tomorrow we rebuild on the plans shaping today.

Biggest Big Trees

How big is your tree? This is a question several thousand tree hunters have been asking during the past two years—and they are finding out. Cooperating with The American Forestry Association in its search for the largest specimens of native American trees, these enthusiasts now have the satisfaction of establishing the "champions" of 220 different species and varieties.

Among these champions, five have circumferences of fifty feet or more, twelve are between thirty and fifty feet, and thirty-nine are from twenty to thirty feet in circumference. Forty-two states are represented on the new roster of big tree champions, issued January 1. Maryland leads with forty champions, California is second with twenty-four, Oregon has twenty-three and Ohio fourteen.

Should you be interested in a complete report, just write the Editor.

To Burn, Or Not To Burn?

Southern pine forests have been the scene of a controversy about forest fire almost as hot as the perennial fires themselves. Foresters, charged with the onerous duty of protecting the piney woods, wanted to outlaw all fires. Silviculturists, that breed of foresters who study the phenomena of tree growth, discovered that fire, like some dangerous drugs, when used under controlled conditions, have a life-saving place in the technique of growing certain southern forests. When this got around in the pine belt, local inhabitants haled it as confirming their established folklore, completely overlooking the controlled part of controlled burning.

Perhaps the "full protectionists" were slow in seeing the value of using fire as a tool. Perhaps the silviculturists, intent on their studies, sometimes failed to make it clear that to have controlled burning it is first necessary to control uncontrolled burning. Certainly this has not yet been accomplished. Perhaps it will be nearer achievement with full knowledge and admission of the need and technique of controlled burning as set forth by Professor H. H. Chapment in his article "Pines and Fire" on page 62 of this issue. During the past thirty years Professor Chapman has accomplished much in working out both principles and techniques.

—So He Went Hunting!

Back in 1941 Bill Musgrove was a forest-fire guard and parachute jumper out in Montana. Today, as First Lieutenant Musgrove of the Marines, he is a hero — all because he went hunting.

It happened on Tarawa. Landing at dawn on the first day of the invasion, he operated a machine gun until it was knocked out. Then, with a rifle, he launched a one-man war on the Jap defenders, hunting snipers relentlessly for two days. On the third day he acquired some TNT and went about blasting Jap pillboxes.

According to the Forest Service, Bill was a Marine paratrooper until he became too heavy—he weighs 200 pounds. He was then assigned to an amphibian tractor outfit, and was supposed to deliver supplies to the landing parties. But on Tarawa his tractors and outfit were destroyed—so he went hunting.

Paper Scarcities

We Americans, sad to relate, are beginning to palpitate a bit over what we term "scarcities." Despite the fact that, by comparison, we still sit in the lap of luxury, far too many people are abusing the need for curtailing some of the small conveniences around which we have fashioned our everyday life. Paper products, for instance. We argue with the grocer when he attempts to conserve paper bags; we assail the druggist about the inferior quality of paper handkerchiefs; and we condemn newspaper editors for cutting down on society news to save newsprint.

This is why the observations of Dr. Edwin C. Jahn, professor of forest chemistry at the New York State College of Forestry, made during a recent visit to London, should be read with more than passing interest. "Napkins, handkerchiefs and paper ornaments and many other common articles made of paper have completely disappeared in England," he writes. "The Britisher's newspaper is only a fraction of its former size—and he is lucky to get one. When he buys an article he must carry his purchase home unwrapped. A letter he receives is usually sent in a re-used envelope having a war economy label to cover the old address. A pipe smoker must bring a container when he buys tobacco."

In more ways than one are Americans blessed in their forest heritage. But to become too complacent about it, or about the job before them, is to invite "scarcities" even more drastic than the British are enduring.

Exit "Forest Rangers"

With a special program marking completion of its twelfth year on the air, "Uncle Sam's Forest Rangers," one of radio's oldest dramatized educational programs, bid farewell on January 6 to its familiar spot on the National Farm and Home Hour. The program was presented by the National Broadcasting Company in cooperation with the Forest Service.

In its long life of broadcasts in the interest of forest conservation, the program had the help and interest of many of today's well known radio people. Frank E. Mullen, vice president and general manager of NBC, and a director of The American Forestry Association, was instrumental in initiating the broadcast in 1932. Harvey Hays, veteran radio actor, has since the beginning been featured in the role of "Forest Ranger Jim Robbins."

The program has contributed much to the conservation movement. Here's hoping "Ranger Jim" soon returns.

Ovid Butler

"Ever deeper, deeper, deeper
Fell the snow o'er all the landscape."

—Hiawatha

Editorial

DISCUSSION AND FACTS

WE ARE interested—as we hope many others are—in the recent exchange of views between the chief of the Forest Service and the secretary-manager of the National Lumber Manufacturers Association.

Back in September, commenting upon a speech made by Lyle F. Watts and given wide publicity, Dr. Wilson Compton declared: "In normal periods the basic American forestry problem is not one of scarcities but of surpluses, not of timber famine but of timber abundance."

To this the chief forester replied, in another public address, this time in Chicago: "Since the crucial factor is the existence or lack of surplus timber supplies rather than whether we view such surpluses as liabilities or assets, let us inquire where these surpluses may be." He then described the country's timber supply, region by region, and failed to find any surplus, or any evidence that fear of surpluses has retarded the progress of industrial or private forestry. And he suggested that such talk about surpluses was really intended to head off public regulation of forest practice on private lands.

Despite its note of attributing motives to other folk—and both parties have indulged in this—we are strong for such discussion, and hope there may be more of it in which other informed, articulate citizens will join. Particularly do we look forward to a broadening of its scope to embrace the really fundamental issue of whether the public desires to have the federal government reach its long arm into every logging camp and woodlot. We believe that there is wide acceptance of the idea that some sort of public control over forest harvesting is necessary. The rub seems to be whether this need is so urgent as to justify a further extension of federal authority over local and private affairs, with its threat against the sovereignty of the states.

Thus our dilemma begins to take shape. On the one hand we must know how serious the forestry situation really is, and on the other we ask what the federal government proposes to do and how satisfactorily, all things considered, it will perform. These are delicate topics; yet they demand fact-facing and frank discussion.

It is evident that neither party to the exchange described above is wholly satisfied with the timber supply statistics used by the other. Nor are we satisfied, for reasons quite apart from motives or intentions. We do not think available facts are complete or down-to-date. So this Association has undertaken the task of obtaining a nation-wide factual picture of our forests and the war's effects upon them and of telling the whole story exactly as we find it, in understandable terms. Thus we aim to make a contribution to this discussion, speeding the day when all Americans can agree on the facts and join in framing workable, wise forest management policies for the whole country.

CHRISTMAS TREE WASTE

WITH great bonfires of unsold Christmas trees still smouldering throughout the country, people who until a few days before the holidays had anticipated a serious tree shortage are asking, "What happened?"

Frankly, we do not know. Along with everybody else, we predicted that Christmas trees would be hard to get—and expensive. In this we were partly correct. On the streets of wartime Washington northern grown fir and spruce were priced at a dollar a foot. But in view of acute manpower and transportation shortages, the fact that the morning of December 25 found a record number of unsold trees on city sidewalks and lots is not easily explained.

Perhaps the public's refusal to pay excessive prices had something to do with it, although money was plentiful. Perhaps fewer people, because of family dislocations, trimmed Christmas trees this year—but this would hardly account for the surplus of 200,000 trees in states like New York and in California. The most plausible explanation to come to our attention is contributed by Joshua A. Cope, extension forester of New York, who attributes the unprecedented wastage this year to an excessive supply of trees, cut in anticipation of scarcity prices.

"Early in December," he writes, "information got around about the fabulous prices being paid for Christmas trees, so everybody that had anything green started cutting and anybody with any kind of a vehicle started hauling the trees to market. One New York farmer sold a thousand red pines to a dealer at the roadside for $1.75 a tree—a handsome return from less than two acres of land." Despite a labor shortage on farms, Mr. Cope, on a trip early in January, observed trees stacked in the dooryards of every farm house bordering the highway. On Christmas Eve, he reports, there were 5,000 unsold trees along the highway between Albany and Syracuse.

"Only at Ithaca," he said, "were less than a hundred unsold trees found on Christmas morning. This is due to the fact that for the past decade enough trees have been grown locally to supply the normal requirements of the city, and city dealers refuse to accept consignments from other sources."

Here, it seems to us, is a commonsense approach to the situation, particularly in wartime when excesses and waste of any kind should be avoided. But more than that, here is one more graphic example of trees, under proper growing and marketing conditions, proving a valuable asset both to the landowner and to his community. It is an example that should be closely studied by utility companies hesitating over the economics of planting reservoir watersheds to trees; by communities, large and small, still questioning the dollar and cents value of community or town forests; and by farmers who continue to think of trees mainly as providing shade for their livestock.

No, we do not know all the reasons for the 1943 Christmas tree debacle. But up around Ithaca they seem to have the answer on how to prevent such conservation tragedies.

This 20,000-ton sawdust pile at Westwood, California, when chemically processed, will produce 10,000 tons of wood sugar, or 1,000,000 gallons of alcohol. The country's annual mill waste pile exceeds 25,000,000 tons, enough to produce 10,000,000 tons of wood sugar, or 1,000,000,000 gallons of alcohol. Utilization of logging waste, such as boughs and tree tops, might double or treble this figure

WOOD CHEMISTRY ENTERS A NEW AGE

The Place and Possibilities of a Chemical Industry Based Upon Wood Waste

By J. A. HALL

Engaged in the work of this government in developing wood-sugar processes, particularly the German Scholler process, is Dr. J. A. Hall, chief biochemist of the U. S. Forest Service, who here tells not only of experiments being made at the pilot plant in Marquette, Michigan, but explores the whole field of chemical research based upon permanent forest industries. A Hoosier, he was before coming to Washington on this important war assignment, director of the Central States Forest Experiment Station.

THERE should be practically complete agreement as to the desirability of getting the forest industries upon a permanent basis, geared to the productive capacity of the land, to the species and qualities of timber available, and to the various factors that operate to keep manufacture going. What are the capabilities of certain chemical developments to contribute to such a program? What about the practicability of those developments, both in the war program and the peace that will follow? Certainly there is nothing to prevent planning the means of attaining victory so that they may also contribute to winning the peace.

The war among materials will become more fierce when peace comes, and lasting victory for any one of them cannot be attained. In such a continuing war there are two factors that determine and maintain any temporary advantage gained—cost and serviceability. Therefore, in order to maintain any advantage for wood, there must be unceasing effort to reduce the cost of the product and improve its capacity to perform the services for which it is used. Chemistry can be of service in both respects.

Heavy transport costs on western and southern lumber have operated toward forcing the sort of selection for quality that is in direct opposition to those practices that would insure good forestry. Unfortunately, the forest does not grow trees exclusively for the high-grade lumber market. If trees are cut and manufactured only for that market, there are two major effects: the gradual deterioration of the forest, and a huge pile of sawmill and logging waste that is the larger because of the low marketability of anything but good lumber. It costs money to dispose of waste, and certainly it costs money to correct in the forest the maladjustments resulting from unbalanced cutting practices. These costs are added to the cost of lumber which, I believe, is already too high to insure its maintaining its position in a fiercely competitive system.

The cheapest way of maintaining a forest in productive condition is to harvest the increment at reasonable intervals and in a manner so balanced that when the harvest is over, all that remains to be done is to protect the forest and let it grow. That is the ideal situation.

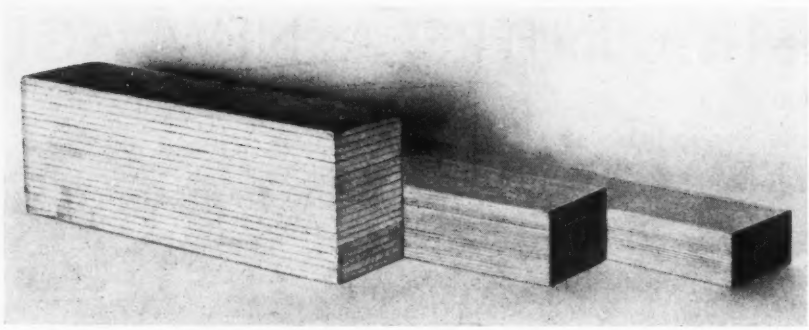
More progress toward such management may be made by attempting to arrange for the removal of low-grade trees from the forest for conversion into useful products at a profit; for the collection and conversion of logging waste at least at a net cost less than that required to dispose of it in the woods; and for the conversion at a profit of milling and manufacturing wastes. Under this sort of system, the major part of stumpage costs must still be borne by lumber, but logging and conversion costs can be distributed, thus making possible cheaper high-quality lumber, less volume of low-quality lumber, and reasonably good harvesting practices. This, broadly, is diversified utilization.

Diversified utilization ought to be combined with what may be called integrated utilization. By this is meant utilization in which the waste material from one branch of the industry becomes the raw material of another, or several industries operating on the same log pile. There are familiar examples of this in other industries, but in the forest products industries examples are all too rare.

There are two principal lines along which chemistry may operate. First, through various means, it seems probable that the usefulness of wood itself can be greatly increased. Second, there are more and more opportunities for the chemical conversion of wood to derived materials of a wide range of usefulness.

Considering the first case, namely, the improvement of the form and usefulness of wood by chemical means, there are certain inherent properties of wood that militate strongly against its wide adaptability. For example, normal wood shrinks and swells by the taking on or giving off of moisture in accordance with atmospheric conditions. For many years scientists of the Forest Products Laboratory at Madison, Wisconsin, have studied the problem of the movement of water in wood and, having pretty well established the facts concerning this matter, they have proceeded to do something about combatting this inherent tendency. At first glance it might appear that all that need be done would be to plug up the voids or empty spaces in wood with some cheap material that would effectively seal it against the ingress and egress of water. Apparently this cannot be done because even a slight failure in such an internal surface coating allows water to enter, and essentially the same results in swelling are obtained as though no such coating were present.

A new approach was made possible by the discovery of certain forms of the synthetic resins. The trouble with most of the materials that had been attempted as fillers for wood for moisture-proofing was that they were big molecules, and the tiny submicroscopic spaces in the wood were simply smaller



Compreg—or wood impregnated with synthetic resins and compressed up to about one-third of its original volume. Here are stages of compression

than the molecules the chemists were trying to introduce. The molecules of these synthetic resins are also large, but the simpler molecules from which the resins are formed are very small. Therefore, what the chemists at the Forest Products Laboratory have done is to impregnate wood with the components of these synthetic resins, and then by the application of heat to the impregnated wood, form the resin in the voids they were trying to fill. This has worked rather well. However, there is another effect. When wood is treated with the components of these synthetic resins and subjected to heat, it becomes plastic, and while the resin is being formed it can be compressed to about one-third its original volume. Thus, not only have the tiny voids of the wood been filled, but by compression the amount of empty space to be filled is greatly reduced.

Such a product is called compreg. It is hard and dense, and has the same finish all the way through. If it is scratched, the scratch can be rubbed out and the piece will have as good a finish as before. Its strength properties approach those of a mild steel.

This effect can be obtained on a solid piece of wood, or a good many thin laminations can be built up with almost any degree of orientation of properties it is desired to have. Then, because the degree to which the mass is compressed can be controlled, material can be made of almost any density required between the limits of the density of normal wood and a highly compressed specimen. Such a treatment requires clear wood, but it may be possible to use small pieces, available by dimension cutting from low-grade boards.

Important new products have been recently developed in the field of pulp and paper chemistry. There is, for example, a laminated paper plastic somewhat similar in its properties to compreg. Many sheets of paper impregnated with the components of phenol formaldehyde resin are pressed together under the application of heat, and a very hard, dense, strong product is obtained in which the distribution and orientation of strength properties can be controlled to a large extent by the way the lamination is carried out, because fibers are oriented in the direction of the operation of the paper machine. There are other similar products, impregnated with lignin—lignin recovered from the alkaline pulping processes.

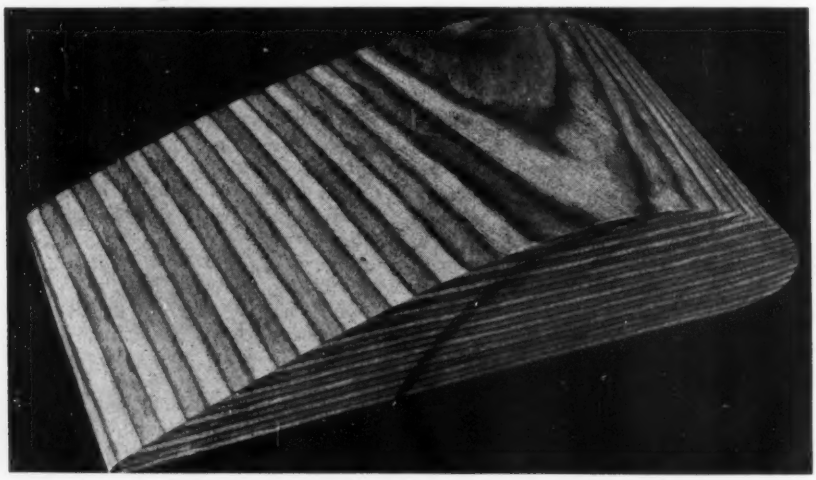
So, even paper, potentially an important product derivable from milling and logging and forest waste, begins to take on the aspects of a broadly useful construction material which may give the light metals heavy competition in the postwar world.

In order to utilize the potentially huge volumes of sawmill and logging and forest wastes, means must be found that will require tonnages far in excess of any of the uses discussed thus far. Such outlets must be sought in fields that can employ wood as the raw material for chemical engineering industry, manufacturing chemical products. There is nothing new about this approach, but that which is impractical in one decade often becomes practical in a succeeding one, either because of shifting economic conditions or of technological advances.

The largest potential field for the utilization of wood as a raw material for chemical engineering industry at present is offered by its conversion through hydrolysis to sugar and lignin. To effect the transformation of the cellulose and the hemiselluloses of wood to simple sugars, it was long ago determined that wood could be treated with strong acids under conditions of high temperature. The process is called hydrolysis.

During the first World War, a process for the manufacture of alcohol by the fermentation of wood sugar produced by a process of hydrolysis was developed by the Forest Products Laboratory. Briefly, it attempted to obtain the optimum yield of fermentable sugar by one digestion of wood waste in a rotary digester using dilute sulfuric acid and steam pressure. The yield was comparatively low.

In the interval between the two world wars, Scholler of Germany worked out an improvement in wood hydrolysis technique. The ground wood waste is packed in large, tile-lined, steel cylinders that are stationary and equipped with a filter cone at the bottom. Successive batches of hot, dilute sulfuric acids are introduced at the top under pressure and percolate through the wood mass to the bottom where they are successively drawn off in the form of sugar solutions, cooled, neutralized, fermented to alcohol, and distilled. By carrying on this process through a number of acid batches, all of the cellulose and hemicellulose content of the wood can be converted to simple sugars and largely recovered in fermentable form with a high yield. This is the process that the For-

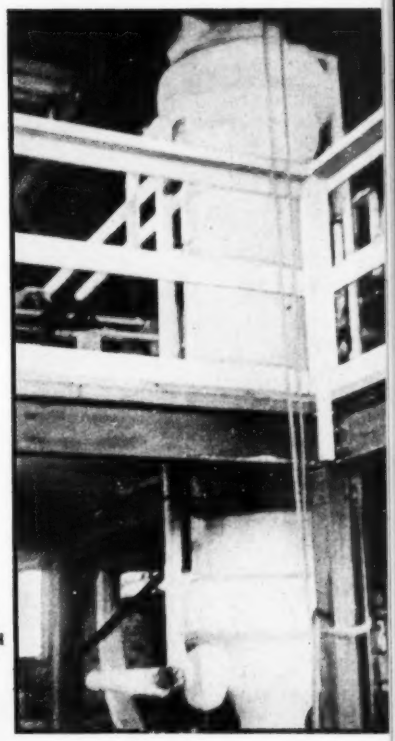


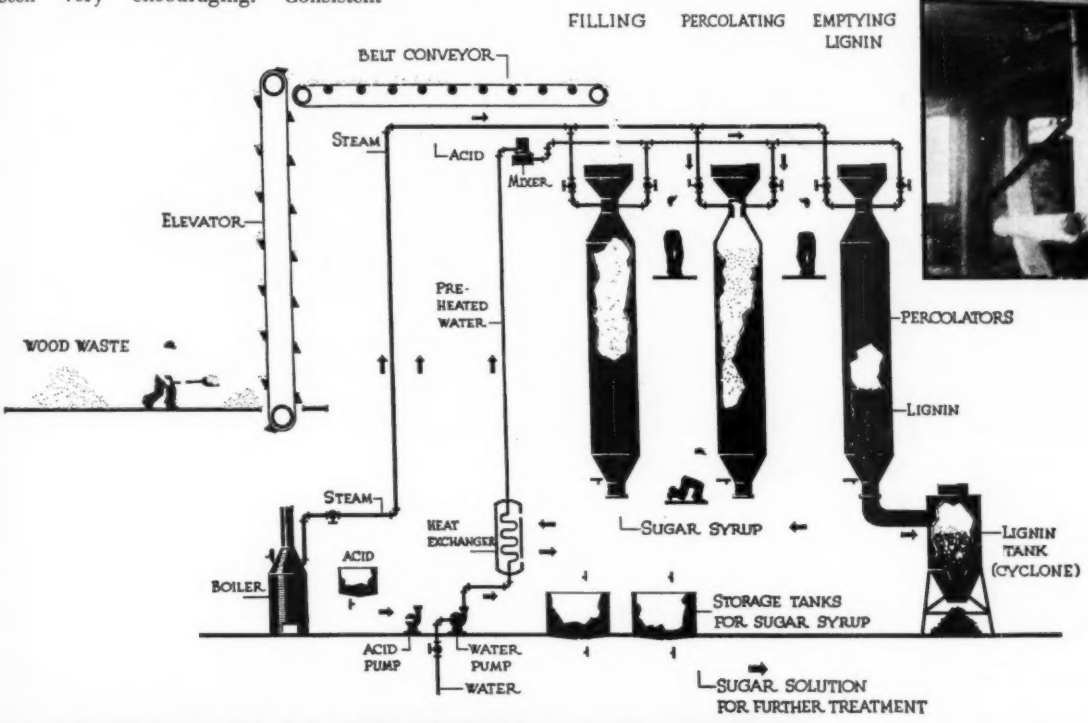
Section of airplane propeller made of laminated compreg. Hard and dense, and with the same finish throughout, it has the strength properties of mild steel

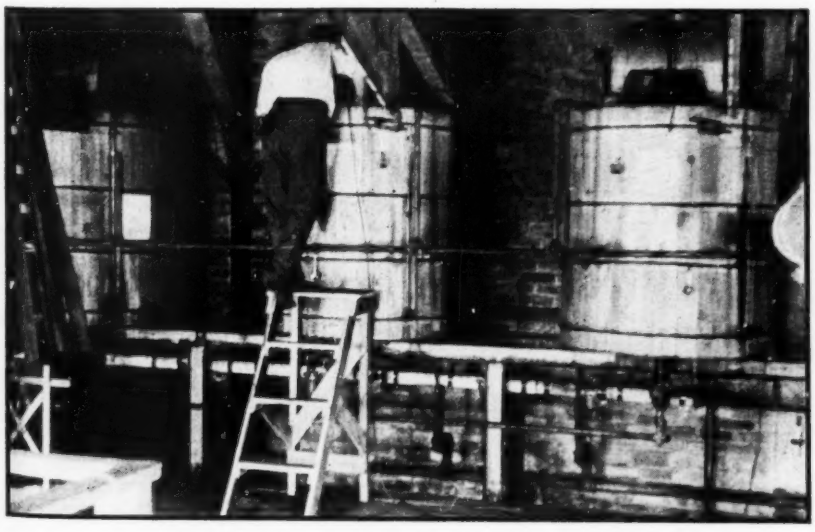
est Products Laboratory, in cooperation with the Office of Production Research and Development and the Cliffs Dow Company, has been operating as a pilot plant at Marquette, Michigan. Attention has been confined mostly to softwood waste.

This pilot plant operation was intended primarily to explore the applicability of the Scholler process to American species and conditions and to work out such modifications in procedure as seemed desirable for adaptation in this country. The intent was to establish a broad wood base for the production of the large quantities of industrial alcohol required for the war. Results have been very encouraging. Consistent yields of alcohol in excess of fifty gallons a ton of wood waste have been obtained with relative ease. The applicability of the process to our major western and southern species has been thoroughly demonstrated.

It is impossible to forecast accurately all phases of costs. However, certain features can be rather well calculated. The average cost of hauling wood to the plant from within a radius of twenty-five to thirty miles by rail amounts to about a maximum of three and two-tenths cents a gallon of alcohol. In some locations this item will fall below two cents, but for purposes of calculation the higher figure has been used.







In the present state of development it has been thought wise to consider only sawmill waste as woods labor and transport to the mill already have been put into it. It is, in effect, a waste material that costs money for disposal. It has

(*Turn to page* 78)

The Scholler process, now being adapted to conditions in this country, utilizes stationary (above) instead of rotating cylinders. Wood waste is poured in the top and packed tightly under pressure. Then, successive batches of hot, dilute sulfuric acid are introduced, also under pressure, and the solution, forced through the waste, can be drawn off the bottom (below). The acid is then neutralized and the sugar fermented into alcohol

Once a sacred tree, the flowering Paulownia has been put to many commercial uses by the Japanese

PAULOWNIA AS A TREE OF COMMERCE

Can This Fast-Growing Asiatic Tree, Valued as an Ornamental, be Successfully Developed in This Country as a Source of Lightweight Lumber? Here are Its Possibilities

By JOSEPH L. STEARNS

FORESTERS and lumbermen would do well to investigate the commercial potentialities of Paulownia, or Empress tree, one of the many ornamental Asiatic trees growing in the United States. A rapid grower and practically free of common tree diseases and insects, its lightweight wood, a staple article in Japanese commerce for many years, is exceptionally well suited for such uses as crating and boxing lumber and as cores in veneer panels. The Japs put it to many other uses, and although recent statistics are not available, it is probable that consumption of Paulownia wood in Japan exceeds 100,000,000 board feet a year.

Originally imported for its esthetic value, Paulownia is now common in much of the eastern half of the United States. Even on poorer soils it will grow rapidly. Considering this, along with the fact that its lightweight wood is fairly strong, and that need for such wood for crating and boxing lumber in an age of airplane express will no doubt be great, it seems reasonable to believe that Paulownia offers excellent possibilities for commercial reforestation. Furthermore, on cutover forest lands of the South, it is believed that plantations of this species can be made to provide a crop of sawlogs in from ten to fifteen years.

Japan is generally thought of as its native home, but Alfred H. Rehder, in his "Manual of Cultivated Trees and Shrubs," claims that the Empress tree originally grew in China and was later introduced in Japan. The generic name *Paulownia* was bestowed in honor of the Netherlands princess, Anna Paulowna. The name "Empress Tree", on the other hand, is attributed to the story that this tree was the favorite of a former Japanese empress. She ordered many of

them planted in the royal gardens at Tokyo, and in traditional Japanese fashion the populace soon came to regard the tree as almost sacred. As a consequence, it was not cut for many years. In the official Japanese Government book, "Forestry in Japan," published by the Bureau of Forestry in 1910, all the principal economic trees growing in Japan are mentioned except the Paulownia. Either this tree was still protected at the time, or it was excluded because it was not a native species. In recent years, however, the wood has been a staple article in Japanese commerce.

What caused this sacred ban to be lifted is not definitely known, but in the writer's own opinion the restriction was terminated at the instance of Japan's aggression in China, which had its beginning in 1912. Evidently the Jap militarists decided to reverse the national policy regarding Paulownia after discovering that the tree was a native of their enemy China, and not of Japan.

The imperial crest on the personal business letterheads of the Mikado once consisted of a design of Paulownia leaves. Whether this crest is still used, in view of other developments, now appears doubtful.

The superstitious and religious idiosyncracies of the Jap mind are hard to comprehend. For instance, our Army Air Force was advised, presumably by intelligence officers, that to be caught under the falling leaves of *Kiri* (Paulownia) was an omen of unavoidable bad luck to any Jap. Not missing any bets, our Army planes made a leaflet raid over Attu Island prior to the recent invasion. These leaflets, for the first time in the history of modern warfare, were real "leaflets," consisting of facsimiles of Paulownia leaves. Obviously, they had no effect on the morale of the Attu Japs, since the island defenders fought to the last man regardless.

There are about ten species of Paulownia in China, but only *Paulownia tomentosa* (Thunberg Steudel, formerly known as *Paulownia imperialis*, Siebold and Zuccarini), and a few of its varieties are known in this country. One, *Paulownia tomentosa* var. *pallida*, has a pale violet flower; another, *P. tomentosa* var. *lanta*, has very pubescent leaves, twigs and flower stalks. This latter is perhaps the hardiest type. It also reaches the largest size.

Japanese Paulownia production was first recorded in 1915. In that year nearly 14,000,000 board feet were cut in Japan and 4,000,000 feet imported from other Asiatic countries. The popularity of the wood caused a spectacular increase both in native production and in imports. By 1921, Japan was cutting 22,000,000 board feet a year and importing about the same quantity. No recent statistics are available, but it is believed that the 1940 consumption of Paulownia in Japan approached 100,000,000 board feet.

The Japs use Paulownia for making wooden clogs, which are worn in place of shoes. Another item is the *tansu*, a sort of combination trunk and chest of drawers. Musical instruments, lanterns, lacquered boxes, furniture and portable temple models are other uses where the light weight of Paulownia makes it popular. None of these uses is of any interest to us except that they emphasize the adaptability of Paulownia for any use where lightness of weight is important. It would not be surprising to learn of its use in current Japanese army training planes.

A thin veneer paper is also made in Japan by planing green quartered Paulownia blocks with a large, crude, hand plane. Pressure is supplied by means of a bamboo spring pole fastened to the plane and weighted on the end. The "shavings" thus produced are boiled and treated with a caustic soda solution, after which they are bleached, washed, ironed out flat and bundled for shipment. The Japs put this to such uses as veneering cheap cardboard boxes. Before the war we imported large amounts of Japanese merchandise packed in these veneered boxes. It is doubtful that Paulownia will ever be cut for veneer in the United States. Its manufacture for decorative purposes by our methods would be too costly, and the wood is too soft for use as a face veneer. The best commercial possibilities lie in the light

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The lilac-colored flowers of the Empress tree appear before the leaves

Two thousand seeds are often found in a single pod from a fruit cluster

Paulownia wood, exactly natural size. Note wide annular rings, indicating the fast growth of the tree

FIRE AND PINES . . . . A Realistic Appraisal of the Role of Fire in Reproducing and Growing Southern Pines

By H. H. CHAPMAN

We must learn to use and at the same time control fire, says the author, if we are to continue to raise pines in the South, a natural hardwood region

THERE is a myth about how the Chinese learned to use fire for cooking. One day a house burned down, roasting the family pig. Driven by hunger, the unfortunate family made a meal of the pig and pronounced it excellent. For some time thereafter, roast pig was procured by the simple means of burning down the house over its head. Finally the intelligent Chinese discovered that the benefits of fire could be obtained without incurring any of its destructive effects—and cook stoves were invented.

We claim to be fully as intelligent as the Chinese. In the South, we are faced with a similar problem, the significance of which has only recently been grasped. It is this: How can we use fire in the forest in order that we may have roast pig without burning down the house?

Unmistakable evidence shows that forest fires have occurred in the southern pine belt since the time when these pines first came into being, and long before man appeared with his fire-making tools, culminating in the sulphur match and its accompanying cigarette. Broom sedge, wire grass, palmetto and gallberry have existed as long as the pines and have always burned as readily. Furthermore, when not burned, they built up just as bad a fire trap as they do today. In order to survive at all, the pines had to adapt their scheme of existence to the task of getting the best of fire and turning it from a mortal enemy into a possible friend.

This does not mean that the pines, with every part of their structure composed of inflammable material, could ever achieve the miracle of turning their bodies into asbestos and still function as living plants. No material living organism can or should be immortal. Pines must die, to give place to other pines. Fire does kill pines. So does wind. So do insects. So does shade and suppression. So does drought. Something *must* kill the vast majority of pine seedlings and saplings. Otherwise, the forest giants would not be there—for lack of space to grow.

Something must in turn slay the giants so that other pines can grow up and take their place; and most important of all, something must effectually dispose of the relatively worthless competitors of the valuable pines—the scrub hardwoods, the blackjack and others which, given a chance, crowd in and choke out the pine seedlings by their shade and rob them of water and food in the soil. It is even necessary, if pine seedlings are to be given a chance to start, that the soil be rid of its dense mantle of dead grass, pine needles and hardwood leaves, and its cover of worthless shrubs. The seed needs to fall on

comparatively bare ground, in sunlight, to get the start that enables it to outgrow the host of merciless competitors.

The farmer does not need to be told that if he fails to exercise his powers of control by intelligent work, weeds and grass will take his crop. He also knows that seed sown on unprepared ground has little chance of survival. What he does need to realize is that if he expects to *grow* trees as well as harvest them, similar intelligence is needed to control natural forces; and similar benefits can be expected. Nor does he expect success if he applies identical methods to all crops. Each gets its own peculiar treatment.

In growing trees as a crop, the first thing to decide is what the grower wants. The answer is, the trees that will make the most money—the pines. The next question is how to grow the biggest and best crop at the smallest cost—and by cost is meant man-hours of labor, supplemented by tools or machinery.

But in agriculture man does not supply the rain or the sun, nor the natural powers of the plant to use soil fertility and perform the miracle of growth. All he can do is to create favorable conditions. When he seriously attempts to grow pines as a crop, is he going to *choose* methods requiring large expenditure of his own time and effort, to replace, instead of guiding, natural processes which, if taken advantage of, would accomplish the result better and cheaper? Since nature, unaided, has produced longleaf pine forests which were the envy of the world, does he think he can thwart the essential, natural processes which created them and succeed in growing better forests at less expense?

It comes down to this. Without past fires, there would be no pine in the South. This region is not a natural pine belt, but a hardwood zone. When fire is completely excluded, hardwoods take over and pine is out for good, unless these hardwoods are in turn forcibly eradicated by enormous labor and prohibitive cost, or are destroyed in the process of clearing land for agriculture. We cannot and will not succeed in growing pines by natural processes, and cheaply, if we start by completely upsetting the conditions which permitted the pines from time immemorial to hold their own against these persistent hardwoods, which on poor upland soil never are worth the effort of growing them as an exclusive crop.

Since fire is the one natural force which tips the balance in favor of the pines, we must learn to use fire to our own advantage. But this does not mean that we must burn down the house to roast the pig. There are, in fact, strong reasons for not using fire at all for that purpose if it is the only way that roast pig can be obtained, or if the house is reasonably certain to go up in smoke if we start a fire in the stove. A better way would be to look to our chimneys and exercise at least as much intelligence as the Chinese. Then we would have a good chance to grow pines without destroying the forest.

When fire occurred in nature and not through a forced annual man-created scourge of promiscuous uncontrolled incendiary burning, it followed a well-defined pattern. In longleaf pine forests, before the white man came with his razorback blight, and even before the Indian, fires on an average occurred

Prolonged freedom from fire, the author has found, builds up a veritable firetrap on the ground beneath the pines. Controlled burning clears out litter, shrubs and competing hardwoods

Slash pine, unlike longleaf, is killed by fire in its first stages of growth. After five years, however, it may safely be winter burned

every two or three years, but *not* annually on the same ground, as is man's habit and custom now, when not controlled. With fires of this natural frequency, set by lightning and held over in smouldering snags, no other southern pine was ever able to survive as a seedling long enough to develop resistant bark and grow to be a tree. The longleaf pine alone has surmounted this barrier, and instead of being weakened by the struggle has emerged as the most magnificent and useful of all southern conifers. Why was it found in pure stands over half of the area of the coastal plain? Simply because it was the sole survivor of frequent fires, inevitable on soils so dry that the inflammable grasses and shrubs dominated the ground cover, which they did *not* do on more moist sites given over to loblolly and slash pines and hardwoods.

Why has it taken so long for us to realize that longleaf pine, which will not begin to grow in height until its stem and bud at the ground line is an inch thick and comparatively fireproof, cannot survive even in the shade of a sweet fern bush but must grow in full sunlight? These two facts dovetail into the controlling element of frequent fires, which kill to the ground all brush and hardwood sprouts, weaken and remove temporarily the competing grass and bring the longleaf through the critical period of its infancy.

Why, then, if frequent fires are necessary, are not annual fires still better? The reasons are clear when it is observed that the seeds of this pine germinate in the fall shortly after reaching the ground. They reach it only as the result of fires occurring previous to the fall of seeds within one to three years, and which remove the obstructing litter and dead grass. A fire occurring during the first winter, after the seeds have sprouted, wipes out the crop with hardly a survivor. But by the end of the next summer these seedlings are able to do what no other pine can accomplish. When a ground fire burns off every green needle, the food stored in the roots enables them to send out new foliage in the spring. Hence, winter fires will not kill seedlings one or more years old, except in isolated cases. Losses during the period preceding height growth on plots in Louisiana did not exceed two percent.

But for normal rapid development of the seedling, enabling it to reach the diameter of one inch in from five to six years and start height growth, annual defoliation is similar to trying to feed a horse on sawdust. About the time it gets used to it, death occurs. This pine must have a carry-over of needles at least every other year—preferably two years out of three—if it is to store up food in its roots for normal development. If stunted by annual fires for a long enough period, it is like a runty calf, not worth trying to raise. Annual fires are even worse after the pine begins to shoot up. Then not only the foliage and bud must be fed by its root system, but also the stem.

Since annual fires are anathema even to this phoenix among pines, cannot fires be dispensed with altogether? Suppose we grant the need for clearing the ground of litter and dead grass, in the winter before the fall of the seed, but never just previous to the fall, for then the birds and rodents have a field day. Suppose, as sometimes happens, we have a region where hardwood brush has not yet taken over, shrubs are scarce, and grass is not too dense. Once the seeds germinate, will not the pines come through and make their height growth without further burning?

It has been done, as in one case, at Urania, Louisiana, for the crop of 1913. But when the effort was repeated in

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ELK BELOW!

Taking a Winter Census of the Jackson Hole Herd from the Air Is a Tough But Exciting Job

By ORANGE A. OLSEN

HEAVY clouds hung over the landscape as the pilot brought the airplane to a stop. "Well," he said, "we made it."

"And never was I so glad to be back on the ground, even if it is buried in snow," I replied.

"I was getting nervous, too," the pilot confessed. "Was afraid we'd run out of gas before we found a hole in the fog. Wonder how far it is to a town?"

"Your guess is as good as mine," I said, shivering.

"We're probably somewhere in the Snake River Valley," he ventured. "I kept my eye on the Teton Peaks sticking up through the clouds and estimated they were about fifty miles to the northeast. That would put us over the valley."

We unbuckled our safety belts and climbed out—into sixteen inches of snow. Just as the ship was safely tied down we heard the bark of a dog, and saw coming toward us through the mist a sleigh drawn by plodding horses. I yelled—loudly. The teamster answered, and with a wave of his arm drove directly toward us.

Our new friend, readily identified as a rancher, seemed relieved to discover there had been no mishap, not even to the plane. "I heard you while I was hauling feed out to the cattle," he explained. "You sounded mighty close, though I couldn't see a thing in the fog, and when all of a sudden the motor stopped, I thought maybe there was a wreck."

"We certainly appreciate your coming," the pilot replied warmly. "Now if you will tell us where we are——"

"Lost, eh?" he interrupted. "Where you heading?"

"We're headed for Jackson Hole to count elk," he was told. "Got over the mountains without trouble but Jackson was so fogged in we couldn't land. Had to turn back into Idaho."

"Well, I'll be darned!" the rancher exclaimed. "You sure picked a good day to count elk. Now, let's see, guess you're about six miles from Ririe. It's west of here."

By mid-afternoon the fog had raised somewhat, leaving a ceiling of about 1,000 feet. We therefore decided to fly into Idaho Falls, refuel and get an early start for Jackson the following day—weather permitting. It worked out that way, and at daylight the next morning we were winging toward Jackson Hole, home of the largest elk herd in the world. Fred Deyo, the local game warden, was at the airport, ready to participate in the count.

The warden knew every foot of the game range. He was to act principally as guide and bookkeeper—that is, point out the country to be flown and record the number of elk counted and the location of each band. The pilot's job, of course, was to keep the ship afloat and systematically to cover the areas so that no game would be missed. My job was to look for tracks and count the elk.

The first area to be worked was the Gros Ventre River drainage, a rather easy terrain of open ridges and parks about forty miles north and east of Jackson. En route to its headwaters, the pilot carefully surveyed the topography and determined that it could be covered best by flying up the ridges and down the canyons, with some variations depending on their size and the direction of air currents. Up and down drafts are carefuly watched. Smart pilots never attempt to fly up a canyon in which there is a down draft. Flying at around 600 feet above the ground, the distance at which elk can best be seen and counted, makes parachutes worthless. There is no time to bale out in an emergency. With the method decided upon, the pilot nosed the ship downward and dropped in close.

Being in a great game country, there were immediate signs in the new snow of elk having grazed on the open ridge during the night or early morning. The pilot's experienced eye also had seen the tracks and he needed no instructions as to what to do. He threw the plane into a vertical bank and circled over the tracks, which led to the edge of an aspen patch. The elk were immediately aroused by the roaring motor and moved farther into the trees. But the

leafless aspen failed to hinder visibility and the twenty-three cervidae were easily counted.

Fred jotted down the number and location and jubilantly exclaimed, "They're sure easy to see against that white background!"

Farther up the ridge, along the crest where the wind had swept the ground bare of snow, we found a whole flock of the stately creatures. The first bank over them revealed all bulls—big fellows that objected to the thundering noise of the circling plane. Down the ridge they bolted, but not for long. We were soon directly in front of them. Abruptly they stopped, whirled, and charged again, but only to find that the "flying dragon" headed them off no matter in which direction they sought escape. We counted them, sixty-eight head, and winged into the adjoining wooded canyon where no tracks were found. In the peak of winter elk naturally avoid the deep snow in the timber, seeking the open ridges and south slopes where feed is easier to obtain by pawing or has been uncovered by the wind.

Cruising along from ridge to canyon, we found elk in bunches—large and small. Occasionally a lone bull would be seen. There is a tendency for the cows and calves to run apart from the older males, but both sexes were frequently found together. The largest group was at Goose Wing, an open country of sagebrush slopes and a willow river bottom. As we approached, elk could be seen everywhere. How to enumerate them without getting all mixed up was a puzzle. On previous elk counts in Utah and Idaho we had counted upwards of 200 in a bunch, but this herd was scattered over a good mile.

The pilot circled wide so we could size up the situation and, to our surprise, the elk solved the problem for us—almost. Except for a few that held to cover among the willows, the animals began to bunch. This gave us an idea. Why not round them up? A few flights just above the willow tops up and down the south side of the river routed them out and, by circling the outer edges, the elk were soon brought together. The herd, huddled below us, presented a marvelous sight. Hundreds of heads and twice that many ears pointed upward to give us the thrill of a lifetime.

But it was impossible to count them. They were too closely bunched. And as if sensing there was safety in mass formation they refused to break away of their own accord. The pilot, however, quickly solved the situation. A nose dive directly over the backs of the animals split off a bunch that headed down country. The others followed. With the plane banked overhead it was an easy matter to count them as they strung out through the snow. But it took a lot of circling before that herd of 840 elk was finally tallied.

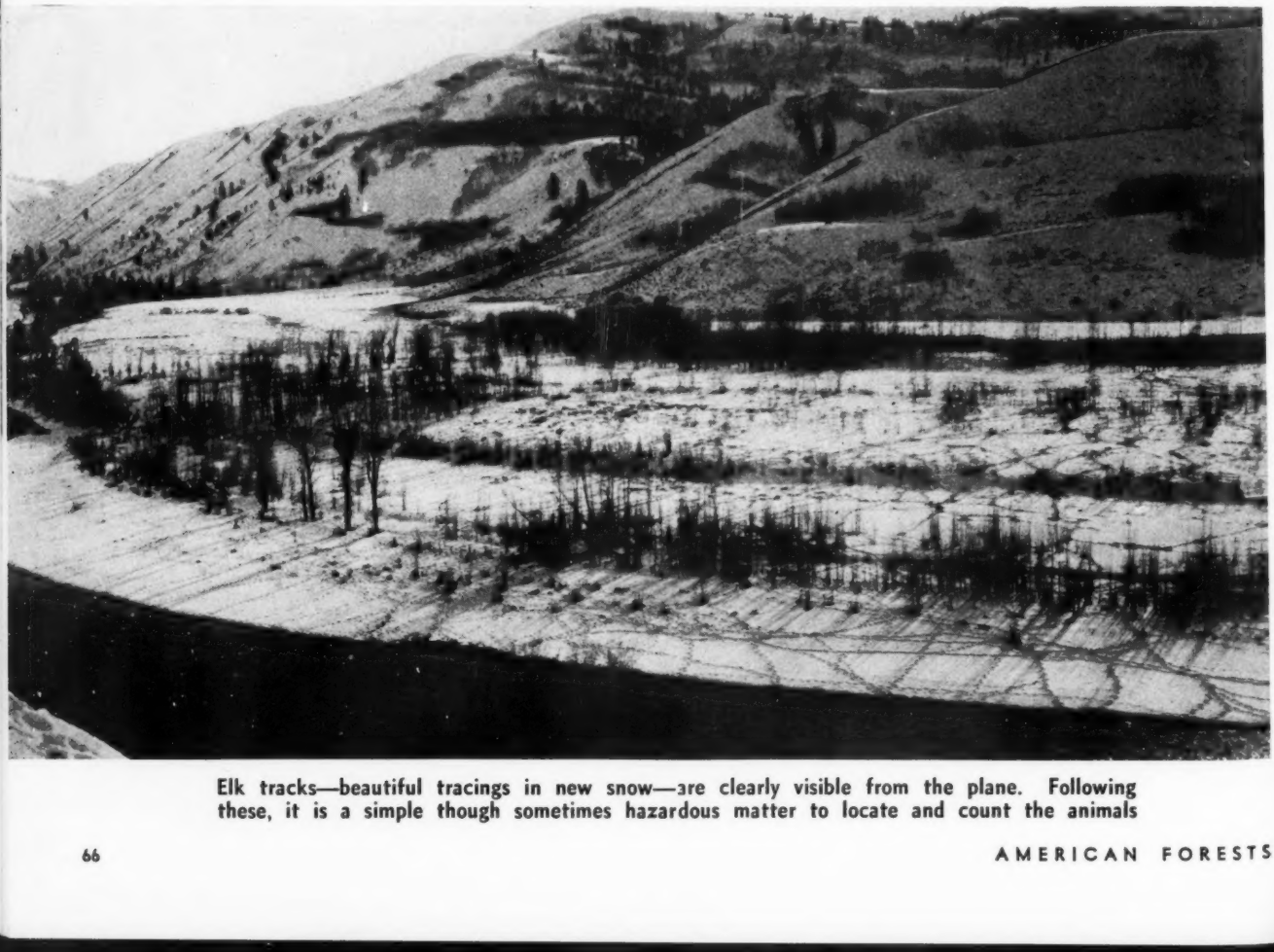
Continuing, we systematically winged over Crystal Creek, Haystack, the Red Hills, and other tributaries of the Gros Ventre in search of tracks and elk. It is even more thrilling to track down game in a plane than it is to stalk them with a rifle or camera. After a little experience, the tracks of deer and big horn sheep can readily be distinguished from those of elk, but frequently what we thought was elk sign, turned out to be moose.

Having completed the Gros Ventre from top to bottom, the ship was pointed toward Jackson.

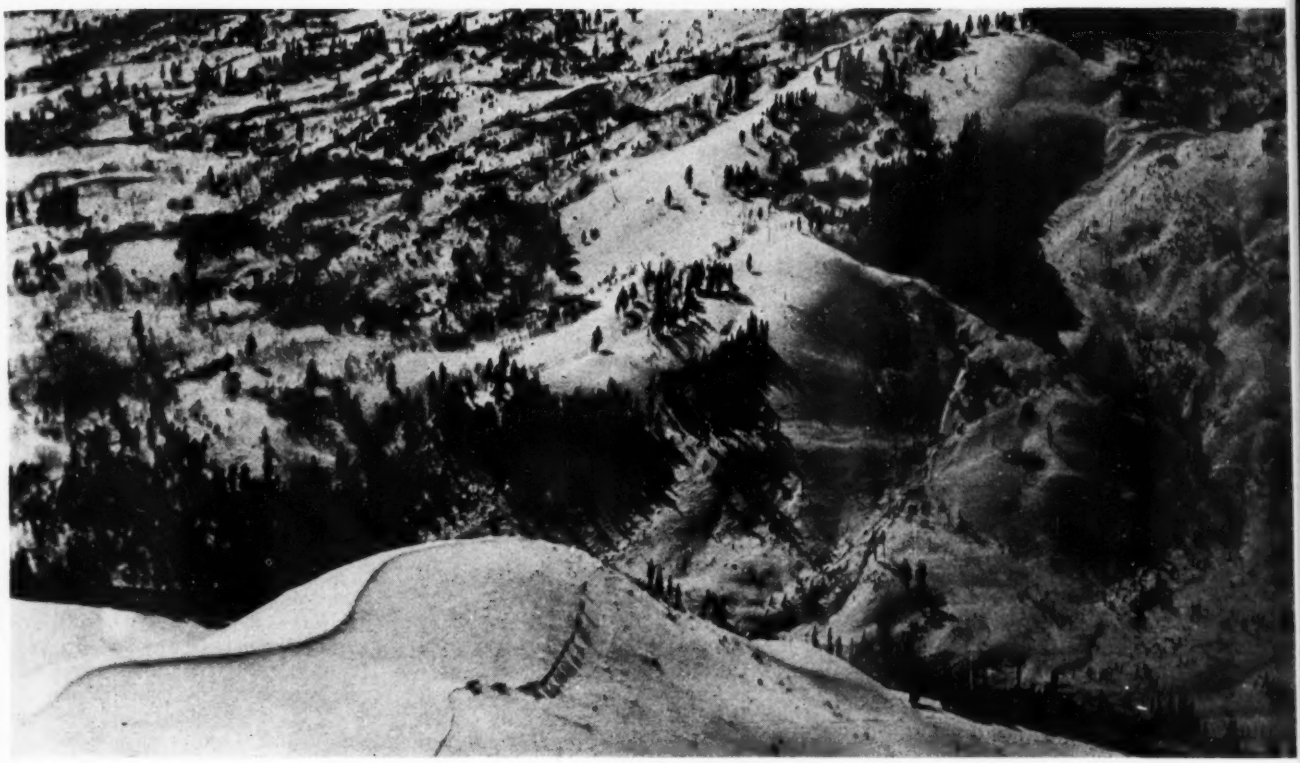
"Well, Fred, what's the score?" I inquired.

"If I've added right," he came back, "the count is 4,590 elk." Then, loosening his safety belt for comfort, he observed: "This is certainly a quick, easy way to do a hard job. Can't believe it."

"By the old ground method, how long would it take to do—well, say just the



Elk tracks—beautiful tracings in new snow—are clearly visible from the plane. Following these, it is a simple though sometimes hazardous matter to locate and count the animals



A quick, easy way to do a hard job is the game warden's appraisal of an aerial elk census. Looks easy enough here

Frightened by the noise of the circling plane, the elk plunge into the deep snow

Gros Ventre?" he was asked.

"Let's see," he reflected. "Two years ago when we made the Gros Ventre check, there were six of us—three forest rangers and three game wardens. Working in pairs, it took about two weeks—and then we didn't get over it all. Sure was surprised to find elk on some of those high ridges. Didn't think they wintered that far back."

"Think we missed many?" I asked.

"Darn few, I'd say. Maybe some that were lying around in the fringes of the lodgepole pine but they sure got up and moved out when we skirted the tree tops. It's astonishing how open the timber is when you're looking straight down."

The pilot, who was now relaxing, asked, "How does this compare with snowshoeing it?"

"Gad, it makes me tired yet to think of how we used to sweat and puff, slip and fall doing it on snowshoes and skis. This flying system suits me perfectly. No more hoofing it for me."

On our return we were met by members of the State Game Department, the U. S. Forest Service and the Federal Fish and Wildlife Service, cooperating agencies in the census and management of this noted elk herd. They all anxiously awaited the results of the morning's flight.

Answering inquiries, Fred announced the total count for the Gros Ventre as 4,590 and, looking at his watch, added, "Actual time three hours, fifty minutes, and take it from me it's the only way to do the job."

Later in the afternoon we took off for the Hoback, a rugged country full of deep narrow canyons and peaks that tower 10,000 feet above sea level. Here's where the pilot uses all his skill and goes to work with both hands and feet. The observers buckle their safety belts tight—it saves some bad bumps. The slopes were generally too steep to climb and in such places coverage was made by spiraling upward or by flying contour. How it is done is the pilot's worry.

A group of bulls were seen feeding on a sharp, windswept ridge. As we circled, they quickly huddled together—only to scatter when the pilot dived in close. Without caution they broke from the ridge top and plunged into the deep snow—forty-seven antlered wapiti.

It was rough going. Banking over the elk and dropping in and out of the canyons was not easy to take, especially for a beginner. But we kept at it at least for the rest of the afternoon. Bad weather, snow and overcast skies kept us grounded, however, the next morning. Good light is essential to a successful count.

But fair skies followed and, after thirty hours of actual flying time, the count was finished. Adding up the census data, 19,855 elk actually were seen, of which 11,255 were checked from the air. Approximately half of a million acres of mountainous winter range had been flown.

The remaining 8,600 animals were counted on the feed grounds. Natural winter range is inadequate to support this great herd and supplementary feeding is resorted to. Normally six feed grounds are maintained—two large ones

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SEQUOIAS IN MONTANA

By SETH JACKSON

Age-old comrades—petrified Sequoia and conglomerate pillar

CALIFORNIA is not the only state which can boast of Sequoias! Among its many other attractions, Montana can lay claim to fame through its petrified Sequoia forests, found extensively on the Gallatin and Absaroka National Forests north of Yellowstone National Park, and in the park itself. When did these forests flourish? Why and how did they turn to stone?

To answer these questions, it is necessary to go back around a hundred million years when what now constitutes the Rocky Mountains was an immense lake extending to the Gulf of Mexico. Violent volcanic upheavals of the earth's crust thrust great mountain ranges—the Rockies—through the sediment of the ages, and the inland lake receded.

The first forest to grow in the Yellowstone region was on a flat basin several thousand feet below the present high plateau. Volcanic mud and ash deposits, held in the basin by the surrounding mountains, covered many successive stages of forest growth until now in some places there are no less than twelve layers of fossil forests.

Petrification can be accomplished by any one of several different methods. First, there can be footprints or trails left by some prehistoric monster such as a dinosaur in a soft material, perhaps clay. When the clay solidifies, the animal's tracks are preserved for eternity.

Or suppose an object such as a pine cone or log is imbedded in ash or mud, and a cast or mold is made as the ash becomes solid. A hole may be left in the rock after the tree trunk dissolves, making a cast; or else an entirely new substance may fill the hole and a mold is produced. One of the best examples of this is found in the ruins of Pompeii. Excavations show exactly how people lived in those early times because casts and molds of volcanic ash surround their streets, houses, furniture—even their clothing and bodies. Another example is that of seeds, pine cones, or insects which are sealed in resin or amber from pine trees. Casts accurate in the minutest detail are then formed as the resin hardens.

Coal is an example of another method of petrification, in which buried plant life is cut off from oxygen and preserved from decay. Under the pressure of the earth's crust, parts of the plant life disintegrate, leaving a residue of carbon which we call coal. Some scientists say that coal is not a true fossil because no organic structure is left, even though the shapes of leaves and the tree trunks can be seen in almost anybody's coal pile. In other words, the cellular structure of the plant has not been preserved.

Still another method of preservation is found when objects become encrusted or covered with deposits of silica or lime. If the mineral deposit is fine-grained, as in clay or limestone, the impression is perfect.

The last method is accomplished by infiltration, or replacement of the material by chemicals. There are some seventy petrifying or mineralizing substances, the most common ones being silica, calcium, carbon and pyrites. Pyritization, or the replacement of organic matter by pyrites, or "fool's gold," produces what are known as golden fossils.

Infiltration may be any one of several different types. The gross form only might be replaced by a mineralizing substance. As the object slowly disintegrates, its bulk form is replaced by some mineral in solution in the ground water. The resulting fossil is called a pseudomorph, which simply means, "similar form."

The type of petrification which is most

Petrified stumps ten feet in diameter speak eloquently of the great size of Sequoias that stood on the Yellowstone Divide centuries ago

perfect and which is of great aid to scientists in solving the perplexing riddles of the earth of millions of years ago, occurs when the organism is dissolved and very slowly replaced, molecule by molecule, by a mineral in the ground water solution, usually silica. Tree trunks and wood are often replaced in this manner. This type of fossil remains is very valuable because even the most microscopic details of the cell structures are preserved for all time. Some of our primeval forests are so well preserved that they can be dissected, identified, and studied like botanical specimens. Wood thus preserved can be very beautiful when the mineralizing substance is opal, jasper, or amethyst.

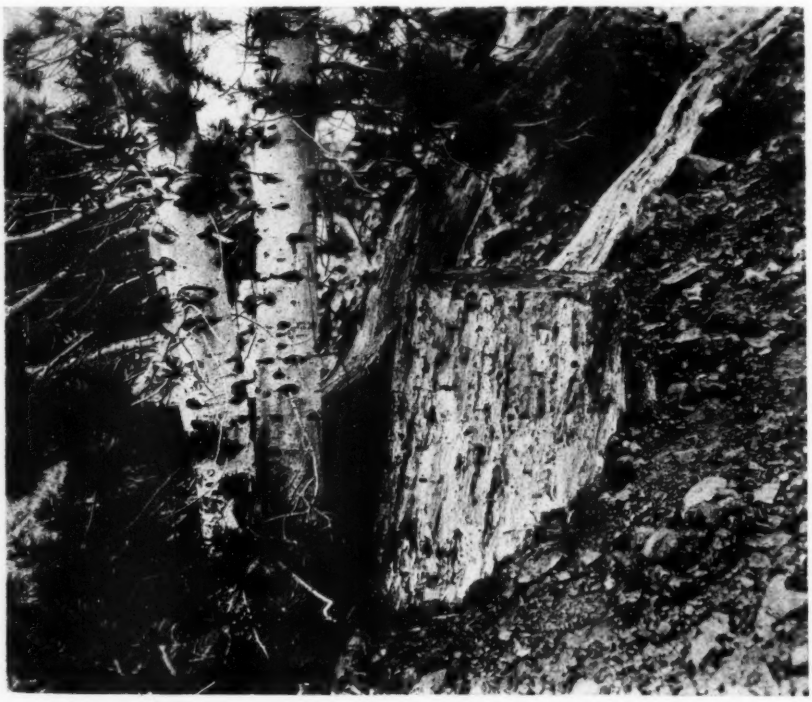
There can, of course, be combinations of the above factors. For instance, a fossilized log could be lignite or coal on one end where it was imbedded in clay; while the other end, in sand, could be made of silica.

Fossils are very seldom found in igneous rocks because these are hot when formed and the organism would be burned up. In most cases they are found in sedimentary formations. The great majority of fossil plants are samples taken at random by the wind and rain and flung into rivers which carry them to where we now find them solidified and deposited in deltas or lakes. Thus, prime agents of fossilization are streams, lakes, seas, lagoons and swamps.

Petrified forests formed by mineral replacement are found in Texas, New Mexico, Arizona, Montana, Wyoming, New York, Oregon, and many other localities throughout the world. But none are more interesting than those found in the Gallatin and Yellowstone areas. There hundreds of upright trunks stand exactly as they grew many thousands of years ago. One large petrified forest area covers 35,000 acres in the northwest corner of Yellowstone. This became a part of the park in 1929, when it was transferred from the Gallatin National Forest to the National Park Service for administration.

Scattered throughout this vicinity, both within the park and in the adjoining national forests, one can find well preserved specimens of fossilized wood. For example, on a recent trip to the headwaters of Teepee Creek on the Gallatin, the writer found many wood specimens in various stages of petrification. They were in an exposed location on the banks of the stream, and were probably uncovered during one of its flood stages many years ago. A few pieces were opalized, while others were scarcely more than partially decayed wood which broke into small pieces when handled. In most cases the trees are upright; all branches either having been knocked off by falling volcanic debris or burned off while the forests were being buried by showers of hot ashes and mud. Since the last eruption, erosion has formed canyons and gulches which have opened up these successive layers of forests. After the trees were buried, ground water carrying silica in solution filled the wood pores and eventually replaced all of the wood cells.

Another giant — where stone has replaced the living wood



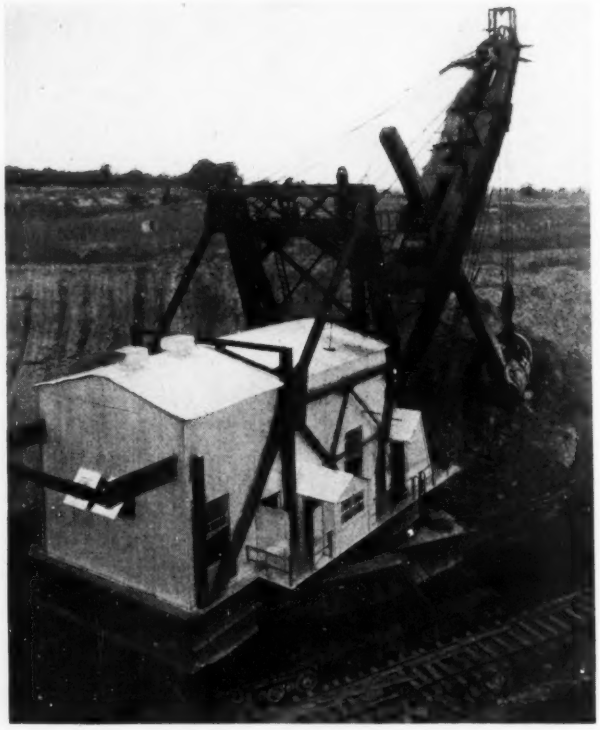
Fossilized trunks of the Sequoias stand upright, just as they grew when Montana was sub-tropical. Here a whitebark pine stands guard

There were conifers such as pine and spruce; there were hardwoods—sycamores, buckthorns and oaks. But the largest and probably the most common of all in the area was the Sequoia. Hence, Montana's boast of groves of Sequoias! Due to the presence of a substance known as tannin, this tree is more resistant to decay than others, and therefore has a better chance to turn to stone.

How large were the Sequoias of centuries ago? There are some petrified trunks ten feet in diameter and thirty feet high. Indications are that they were about the size of the Sequoias of today —250 to 300 feet high. How old were these trees? A count of the tree rings in one stump shows eighteen rings an inch on the average, and a total age of at least 860 years. The region's present day forests of lodgepole pine, Engelmann spruce, Douglasfir would look puny indeed by comparison. What sort of a climate was the earth experiencing when these tremendous trees were common almost everywhere? Montana was then about like Virginia or the Carolinas—or perhaps even more sub-tropical.

In this way do our petrified forests record geologic history.

FORESTRY AND STRIP MINING



Serious land-use problems are created by strip mining operations covering thousands of acres every year

By CARL M. CARPENTER

MOST people think of coal mining as being conducted deep in the bowels of the earth without relation to forests save that wooden props are necessary to support the underground workings. Another kind of coal mining, called "strip" or "open pit" mining has a different connection with forests. Where coal seams lie close to the surface, the cheapest or frequently the only mining method is first to strip off the upper layers of soil and then to remove the coal beneath in full light of day. This process turns the soil upside down, rendering it unfit for agriculture—but not for growing trees.

Strip mining operations covering thousands of acres annually are creating an important land-use problem. According to the United States Bureau of Mines it is carried on for soft coal in some eighteen states and for lignite in a few more. It produces about ten percent of our annual output of bituminous coal. In 1941 seven states each produced more than 1,000,000 tons by this method—Indiana, Illinois, Pennsylvania, Ohio, Kentucky, West Virginia and Missouri, the first four being the largest producers. Taken together they accounted for about three-fifths of all strip mining production. Illinois and Indiana each produced about the same amount and nearly twice as much as Pennsylvania and Ohio.

We Hoosiers believe—without intending to reflect on any other state—that we are doing an excellent job in turning stripped coal lands into forests and that the returns from them will be an asset to our state long after the last ton of strip-mined coal has gone up in smoke.

To give an idea of the size of our problem: Commercial strip mining is now carried on in fourteen counties of southwestern Indiana in a belt about 160 miles long from north to south. It follows the western boundary of the state from Fountain County in the north to the Ohio River in the south. This area averages about fifty miles wide from east to west. Within it some 60,000 acres have already been stripped and it is estimated that from 60,000 to 70,000 remain to be stripped. The exact amount will depend on coal prices and operation costs. The coal seams lie at varying depth. The higher the price of coal the deeper it will be possible to make the pits and more area can be mined. At present seventy feet represents the absolute profitable depth. Most companies stop at fifty feet. Higher prices and improved equipment may extend the depth of operations to one hundred feet. Before the war about 2,000

Stirring and aeration of the soil in the process of strip mining stimulates tree growth. Here a typical mined area is being planted

This flourishing white pine plantation is eighteen years old

acres were stripped annually. Wartime demands have increased this figure by some 500 acres.

Soil overlying surface coal seams, in Indiana at least, is usually shallow and composed of semi-impervious clay with an even more impervious subsoil of the same sort. It was never good agricultural soil and most of it passed out of cultivation before stripping began. There is, therefore, little loss to agriculture

Tuliptrees and black locust in thirteen-year-old plantation

when the buried wealth in heat and power is exhumed.

Modern strip mining is a typical twentieth century mechanized operation. Picture the scene of a huge, electrically powered, self-propelling shovel handling thirty-six cubic yards of overburden at a load, so quiet in its movements as to impart an eerie sensation to the beholder. This shovel is standing on a vein of coal from three to eight feet in thickness, in a pit which may be as much as a mile long, from fifty to one hundred feet wide, and thirty to sixty feet deep, scooping up the dirt, rock, shale and all other material that covers the coal and moving it to the other side of the pit where the coal has already been removed, heaping it into ridges containing a mixture of all kinds of material that is found overlying the coal. Often the ridges abound in huge limestone boulders scattered about; other areas may contain sandstone that weathers away in a few years; still others may have only shale and slate as a thick topping on the ridges. Seldom has man seen landscapes more desolate and hopeless in appearance than newly stripped coal fields—bare, lifeless, rocky and apparently hopelessly unproductive. It is often proposed that these areas be leveled to their former flat and uninteresting form as a prelude to more complete restoration. It would be an expensive job. Moreover, it has been demonstrated that such lands can be made to produce not only economically useful forests, but also turned into valuable recreation and wildlife areas, without disturbing their newly made and, in an otherwise generally flat country, interesting contours.

Given time, Nature will gradually forest stripped areas, as above, but man can speed things along, as jackpine plantation, below, shows

The loosening, the stirring and aeration of the soil in the process of stripping seems to stimulate tree growth. Trees grow faster on strip hills than on adjacent unstripped land—but it is usually best to let the strip piles settle from one to five years before planting. Furthermore, the rain falling onto these areas soaks into the soil—any runoff is caught between the ridges—so that after they are well settled even during droughts there is usually sufficient moisture for trees clear to the ridge tops.

Given time, nature will gradually for-

est these stripped areas, but her progress is slow and her product is mostly trees of poor form and little value. Nevertheless, she gave man the idea of growing trees on them. Forest planting on the strip lands started in 1925 when the Indiana Department of Conservation began experimenting in cooperation with some of the coal companies who wished to find a profitable use for their worked-out holdings. The experiments gave encouraging results. Later ones helped develop sound methods of work, and several of the companies began regular planting on their own initiative. Others made gifts of their stripped lands to the state. One area of about 800 acres, donated to it by the Central Indiana Coal Company, is now part of the Green-Sullivan State Forest. It has been a valuable experimental area. Some other companies made similar gifts to local communities for various conservation uses.

Asset to any community are mined over-lands restored to use—and recreation is an important factor. This area was planted in 1925

Despite considerable progress on a voluntary basis, the state found it necessary in 1941 to step into the picture in a more positive way by enacting a law requiring forestation of stripped land. In the campaign for its passage, the forestry interests had the cooperation of the Indiana Coal Producers Association. Under this law operators whose production exceeds 250 tons in a calendar year must make forest plantations on 101 percent of the land they have previously stripped. The 101 percent provision is to insure that not only area equal to the annual stripping is planted but that eventually forests will reclothe all areas stripped in earlier years.

This law is administered by the Department of Conservation. To secure compliance it requires that before a stripping operation can begin the operator must pay a small license fee and file a bond that the lands will be planted after stripping. Both fee and bond are graduated to the size of the operation. The conservation department is required to make rules and regulations as to planting methods, species to be used, and so on. The operator's bond may not be discharged till the planted area has been approved by the department. If it is not, he must replant the following spring. The department cooperates by selling trees from its nurseries to such operators as desire to purchase them, and to help educate operators and their foremen, also operates a tree planting school each year just before the planting season. After two years of operation, the law has proved workable and compliance on the part of the operators generally has been satisfactory. As the operators learn more about a type of work almost as different from mining as it is possible to find, even better results may be expected.

Experiments have shown that a large number of tree species will grow on the strip ridges, both conifers and hardwoods. Not all species, of course, are equally well suited, or of equal ultimate value, and some are adapted to only parts of the stripped areas. But as a result of experiments and observation, the following species are now considered best adapted to strip hill planting: Virginia, shortleaf, loblolly (in three southern counties only), pitch, white, red and jack pines, black locust, tuliptree, black walnut, red oak, cottonwood, sycamore, and silver maple. Further study is required before large scale plantings of American sweetgum, black cherry, pin oak, white and green ash, baldcypress, and others can be recommended.

Planting space recommendations are eight by eight feet for cottonwood and for silver maple and sycamore when mixed with cottonwood, and six by six feet for all other species. Spring planting only is recommended, although some direct seeding of black walnut and red oak has been done in the fall. The earliest strip hill plantings consisted of only a few thousand trees. As the success of these became apparent, the number planted yearly increased until about 500,000 were planted in 1941. Since planting has become mandatory for all companies, 2,000,000 or more trees have been planted annually.

Looking to the future, we have sufficient evidence to assume that most of our plantings will furnish valuable and useful products. The tuliptree, black walnut and oaks show promise of developing high grade sawtimber in a reasonable period of time. The pines, particularly white and red, also show excellent promise as lumber. Some of the other pines and thinnings in all pine plantations can be utilized in the pulpwood industry.

The best trees for development of an Indiana hardwood pulpwood supply seem to be cottonwood, sycamore, and red and silver maple. Cottonwood and silver maple grow in many places at a rate exceeding an inch in diameter a year. One drawback to cottonwood has been difficulties of seed collection and nursery propagation. Its germination percentage is very low and it soon loses its viability. The use of cuttings has likewise been unsatisfactory.

Another tree which grows rapidly is black locust. Although not a pulpwood species, it has many uses not only industrially but on the farm. Some of the earlier plantings of this species have already brought a monetary return as fence posts. It is easily propagated in the nursery and takes hold on the strip hills with great rapidity. For these reasons it was extensively planted in earlier years of our work. Unfortunately, due to insect infestations, the tree does not do well in pure plantations. Grown with conifers it injures their leading shoots. Mixed with certain hardwoods it seems to find its rightful place. They tend to protect it from insects and it seems to increase their growth. Among the trees with which it has grown well are red oak, black walnut, and tuliptree.

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THE APPRAISAL PROJECT MOVES FORWARD

THE Forest Resource Appraisal launched by The American Forestry Association on January 1 is moving forward. Director John B. Woods, as this goes to press, announced that with the aid of advisors throughout the country, a selected list of men qualified to serve as regional consultants has been built up and that personal conferences are now under way. Two consultants, he made known, have already been engaged, but announcement will be withheld pending further developments. A field staff of eight regional consultants is planned.

Since January 1, Mr. Woods has conferred with eleven state foresters regarding plans for appraisal work in their states. Unanimous enthusiasm has been evidenced for the project, he said, and cooperation is everywhere assured. In fact, proposals have been made by several states for extra-intensive work projects, to be partially supported by contributions of services of state technical men or cash, or both.

A steadily lengthening list of subscribers to the appraisal bears evidence that this country-wide project has the support of many different people who are concerned by postwar forestry uncertainties. Approximately $80,000 still must be raised, however, to underwrite the project on the basis originally planned.

A list of 200 subscribers was published in the January issue. Since then, subscriptions have been received from the following:

Laura C. Allen, New Canaan, Connecticut; J. H. Allison, St. Paul, Minnesota; John S. Ames, Boston, Massachusetts; A. C. Andrews, Minneapolis, Minnesota; and Armstrong Forest Company, Johnsonburg, Pennsylvania.

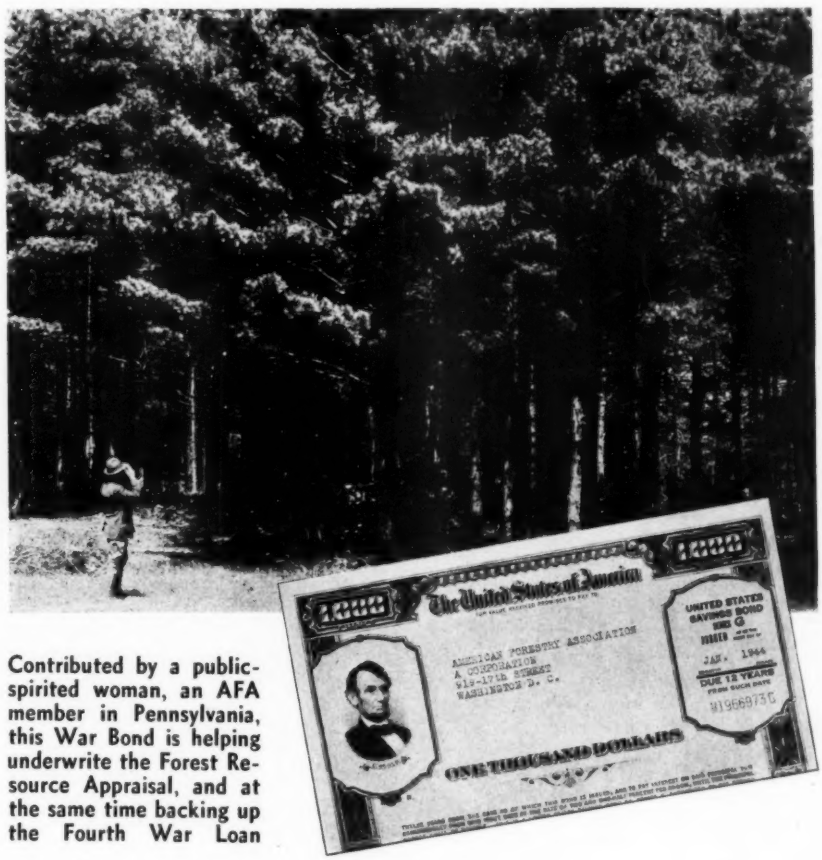
Badger Tissue Mills, Kaukauna, Wisconsin; Mary E. Baker, Orange, New Jersey; Miss Charlotte A. Barbour, Lisbon, New Hampshire; Mrs. John W. Bartol, Boston, Massachusetts; Frank C. Becker, Jr., Norris, Tennessee; Reverend Thomas J. Bigham, Pittsburgh, Pennsylvania; William J. Boardman, Sarasota, Florida; Eric A. Boerner, Pittsburgh, Pennsylvania; and Minnie M. Butler, St. Louis, Michigan.

Miss Winifred B. Chidsey, Shelton, Connecticut; Lt. Edward C. Childs, Norfolk, Connecticut; Mary Rosamond Coolidge, Watertown, Massachusetts; Miss Esther L. Cox, Baltimore, Maryland; Philip Cox, Jr., Bloomfield, New Jersey; C. P. Cronk, Wellesley, Massachusetts; and Crown Zellerbach Corporation, Seattle, Washington.

Alma Davis, Whitehouse Station, New Jersey; Henry Disston and Sons, Inc., Philadelphia, Pennsylvania; Mrs. L. B. Dixon, Del Mar, California; and J. C. DuChateau, Heafford Junction, Wisconsin.

Eastern Corporation, Bangor, Maine; and Ralph J. Edin, Isabella, Minnesota.

W. A. Faris, Beverly Hills, California; Mrs. Herbert K. Faulkner, Keene, New Hampshire; Josiah E. Fernald, Concord, New Hampshire; E. B. Field, East Hartford, Connecticut; Finch, Pruyn and Company, Inc., Glens Falls, New York; Sgt. M. A. Fosberg, LeMoore, California; Miss Helen C. Frick, Pittsburgh, Pennsylvania; and Mrs. Louis A. Frothingham, Boston.



Contributed by a public-spirited woman, an AFA member in Pennsylvania, this War Bond is helping underwrite the Forest Resource Appraisal, and at the same time backing up the Fourth War Loan

H. P. Garritt, New Philadelphia, Ohio; John Palmer Gavit, Winter Park, Florida; P. H. Glatfelter Company, Spring Grove, Pennsylvania; Henrietta L. Graves, Cedar Grove, Maine; D. Hanson Grubb, San Francisco, California; and William F. Guntermann, Harlem, Montana.

Carl Hartley, Beltsville, Maryland; Mrs. Walter B. Hennies, Inglewood, California; S. B. Hepburn, Palo Alto, California; Paul Herrick, Princeton, New Jersey; Helen Hussey, Utica, New York; and Deaconess Harriet C. Hyde, Middle Haddam, Connecticut.

Miss Evelyn Ingraham, San Francisco, California.

Don P. Johnston, Wake Forest, North Carolina.

John F. Kellogg, Winnfield, Louisiana; A. E. Kroenke, San Francisco.

Colonel Hans Lagerloef, New York. N. Y.; Dr. Mary H. Layman, San Francisco, California; Mrs. George B. Lee, New London, Connecticut; Bessie C. Lowry, Minneapolis, Minnesota; and Miss Lea S. Luquer, Brookline, Massachusetts.

Miss Eleanor McCallam, Pittsburgh, Pennsylvania; Duncan McDuffie, Berkeley, California; F. R. Mager, Milford, Connecticut; Leonard B. Markham, Durham, Connecticut; George W. Merck, West Orange, New Jersey; Frederick A. Meyer, Meyers, via Tahoe Valley, California; and Elliston P. Morris,

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WOOD WASTE AND WAR PLANES

New Method of Testing Strength of "Discolored" Airplane Veneers Is Cutting Down Scrap Heaps

By SIGMUND SAMETH

WOOD has re-established itself as a construction material for airplanes. American training planes are of wood construction, and every newspaper reader knows of the famous British all-wood Mosquito bombers. Both now and in the future the use of wood as compared with aluminum for plane construction is not altogether a matter of which is the better. Rather, it is which is the cheaper and more abundant.

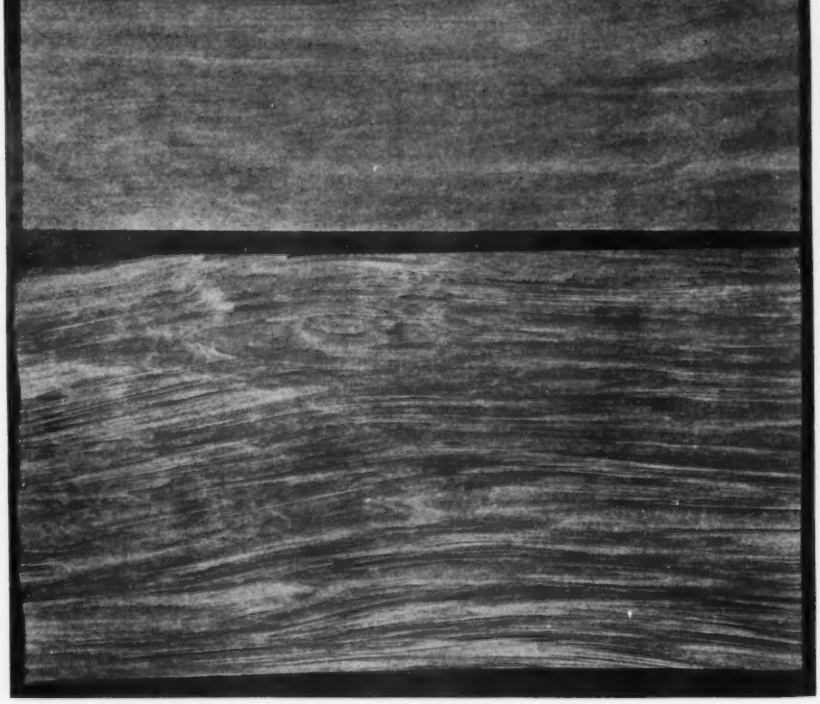
Unfortunately, but a few species of trees produce wood of sufficiently high quality to make airplane veneers—the form in which wood is chiefly used in planes. Nor are these species abundant. Sitka spruce, yellow poplar (tuliptree), sweetgum and yellow birch are usually regarded as among the best. Furthermore, requirements for airplane veneers are highly exacting. Much wood even of these species has to be "culled"—meaning discarded—or used for lower grade purposes because it does not meet the necessarily rigid airplane specifications. This has been a limiting factor in the number of wooden planes that could be put into the air. Most of the culls were thrown out because the wood in the thin veneer sheets was discolored and therefore thought to be decayed, and nobody wanted to send aloft a plane built of partly rotten wood.

A year ago the high waste percentage worried the aircraft industries. Likewise, it worried the technical staff of the Division of Forest Pathology at the Plant Industry Station of the U. S. Department of Agriculture at Beltsville, Maryland. In cooperation with the Forest Products Laboratory of the Forest Service at Madison, Wisconsin, and other agencies, these investigators set out to determine the facts regarding these discolorations. Did they always mean decay?

Fortunately, it has developed from their elaborate tests that for certain woods, at least, the specifications were too rigid. The tests proved that many discolorations did not indicate decay. The result has been a much higher percentage of recovery of usable veneer from logs, chiefly of yellow poplar, sweetgum and birch, which in turn means more planes for the same amount of wood—and produced with less labor.

The tale of these tests and the application of their results is worth recording. The Forest Pathology Division, working on the discolorations of sweetgum, selected test sheets of veneer containing representative discolorations. At the laboratory the specimens were placed in a room with a maintained relative humidity of sixty-five percent and a temperature of eighty degrees Fahrenheit. After all the specimens had been "conditioned," the strength of the different classes of veneer were measured in terms of toughness—an expression of the inch-pounds of force required to break the test strips. This was measured in a so-called "toughness machine" in which a weighted pendulum subjected the specimen to a sudden shock. Toughness—this ability to resist shock—is one of the characteristics most essential in aircraft veneers. It is also the one that is most markedly influenced by rots and abnormalities in wood structure.

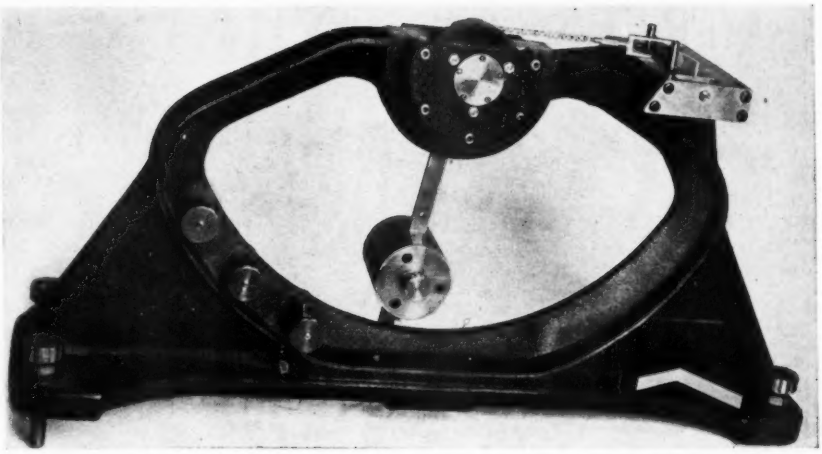
While the sweetgum stain and discoloration studies were in progress, the yellow poplar was also being investigated. The wood of this tree is by no means always yellow; in fact, its shades practi-



Is highly figured sweetgum heartwood (below) as strong as plain heartwood (above)? Tests made of veneer reveal them to be of equal strength

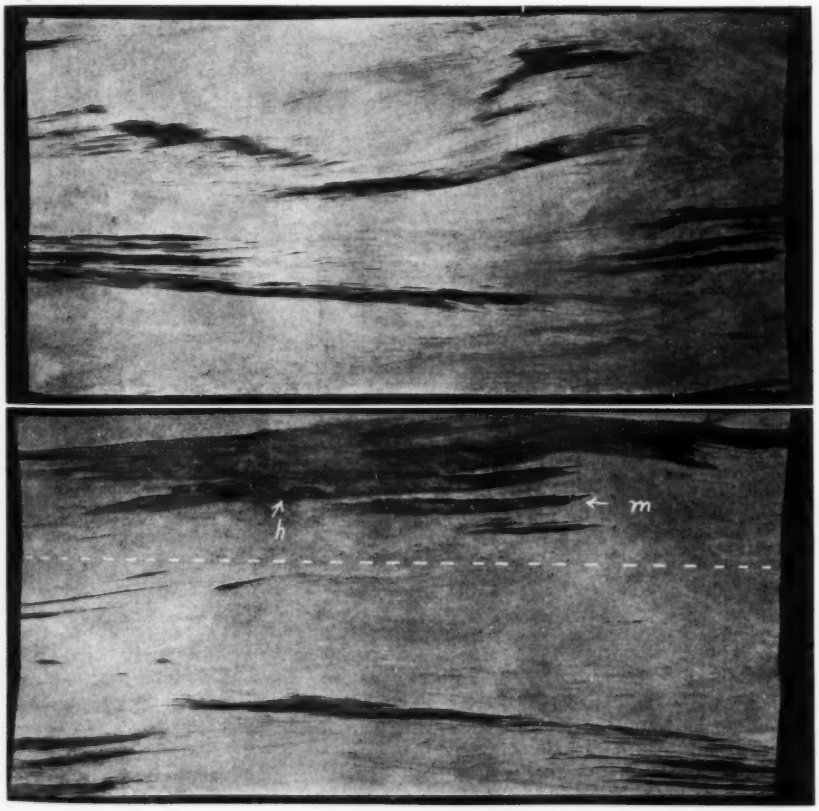
cally cover the whole spectrum. The relation of colorations to mechanical properties had never been studied. What was the effect of its color on its strength? Thousands of specimens from two Appalachian mills were accordingly tested. The report on the effect of colorations and suggestions on culling for aircraft veneers covers many pages. "Blue-butt," prevalent in this species, was found not to be significantly weakening. Oddly enough, in the queer jargon of the timber inspectors, "blue-butt" may be red, purple, purplish brown, or even green. Sap streaks, broad streaks, insect streaks, and "fire streak" were all studied. Four main recommendations for culling on the basis of color were evolved:

"Cull all veneer that is colored any shade of pure brown. There is commonly a purplish or greenish brown band where blue-butted wood joins bright wood, and this need not be culled. Most rots range from straw-colored to brown, and practically all browns—except normal tan heartwood—are weak. Most streaks need not be culled for aircraft plywood but short black streaks called 'fire streaks' should be trimmed out in all cases. Do not cull mass colorations of the following colors: red, yellow, lavender, purple, grey, or any shade of green. Discolorations that cause weakness almost always impart a rough surface to the sheet."



The "toughness" machine, developed to measure the strength of aircraft veneer. The weighted pendulum subjects the specimen to a sudden shock

Yellow birch is a dense wood, hard, stiff and strong, and ranks high in shock-withstanding ability. Veneer sheets were collected from a mill in northern Wisconsin. The test pieces were five inches long, half an inch wide, and one-sixteenth of an inch thick. Shock resistance was measured by the toughness machine previously described. Mineral streaks, heartwood streaks, striped zones, sap stain and many other discolorations were tested. Here are the results: Mineral streaks in both sapwood and heartwood, yellowish to brownish or greenish, indicated slight to moderate reduction in toughness. So do heartwood streaks in sapwood and banded zones in heartwood. Rejections for these discolorations, therefore, were necessary. On the other hand, light colored heartwood streaks, blue-black metal stains, yellow or orange sapwood, and light blue streaks from the ends of logs were found to indicate little or no reduction in toughness.



Mineral streaks (above) and "pathological" heartwood (below) reduce the toughness of aircraft veneer but slightly, unless concentrated

Of the total volume of aircraft-grade yellow birch logs, only about thirty percent can be manufactured into veneer of aircraft quality. The remaining sixty percent is lost largely in cores and in rounding-up on the lathe and for cross-grain and other unavoidable defects. Still another ten percent of rejections of veneers, however, was for decay or for discolorations which are mistaken for decay.

Some of the color irregularities in wood which came to attention were of unusual origin. It was found that any contact between wet wood and iron or steel is likely to cause a bluish black stain at the point of contact. In logs such discolorations center around peavy holes made by lumberjacks during logging operations. In veneer they occur often as straight lines parallel to the grain caused by stopping the lathe while the log is being "unrolled"—a defect known as "knife stain." None of these stains are weakening in themselves.

Just how unflinching inspectors thought it necessary to be was demonstrated in one plant where a sheet was discarded because of black flecks of un-

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TREES AS LIVING COMMUNITIES

By HENRY H. TRYON

March of vegetation over exposed rock outcrop. Nature dislikes open areas

IT IS curious how some things come about. My boyhood was spent in the country, in a far corner of Rhode Island, in the days of horse-drawn stages, kerosene lamps and tin bathtubs. There were no radios, no automobiles, no trolley cars anywhere near, and mighty few telephones. If you wanted to get about, you walked. It was a wooded section, and I naturally became acquainted with the usual run of woodcraft indigenous to such an area. I recall with crystal clarity the first skunk that I trapped and which I immediately (and proudly) skinned on our front porch. The following Saturday afternoon was spent in scrubbing that porch with hotwater and soap.

About the time I was well along in grammar school, I was making one of the rarely-permitted overnight visits with a friend in Providence. We had concluded the routine pillow-fight and were settling down when Harold suddenly shot at me, "What are you going to do when you grow up?"

I had no idea whatsoever, and said so. "Why don't you study forestry?" he inquired. "You like the woods."

I took this suggestion home to my father who, being probably beset with precisely the same puzzlements that are now my lot, promptly made inquiry to the United States Forest Service, the Yale Forest School, the Harvard Graduate Schools of Applied Science, and various other sources. The collected results were spread out on the big table in our living room and, after careful consideration, the proposition looked pretty attractive. True, there didn't seem to be any great plethora of jobs awaiting me, but I was still some years away from college and the sort of life apparently attached to this budding profession fell in with my idea of a pleasant way to earn a living.

All of this happened about forty years ago, and I have had few occasions to regret the choice. It must be admitted that there are few wealthy foresters—to which general rule I am no exception—but I surely have had and am still having a bully good time.

Death of a gray birch forest. Young maple and oak are taking over

The invasion begins. Cedars and their hardwood associates claim old field at right and are already taking root in ground at left, fallow but a few years

For the past fifteen years it has been my job to make some detailed studies of the various forest type successions occurring in New York State. This has been a fascinating assignment. You see, trees occur in rather well-defined associations, depending upon the soil, the climate and the moisture supply available in the area in question. As an illustration, take a former hayfield which has been abandoned. In my particular bailiwick of the Hudson Highlands, the first tree species to invade this opening —for Nature has no love for open, un-

shaded areas—will probably be a mixture of the familiar gray birch, red cedar, red maple and possibly some aspen and white ash. These will rush in together, and in a few seasons the field will be "just a bunch of hardwood brush." If there be present some exceptionally acid spots, the common sweet fern, which I smoked at the age of eleven, will form dense patches thereon.

But observe the steady march of vegetation—the gradual shift from one association of species to the next. Between this first setting of volunteer tree species and the final, or "climax," association there will sometimes appear three or four separate and distinct tree communities. A climax type, by the way, is the very last word. It is the association which finally occupies the ground after all the volunteer primary and secondary and perhaps tertiary types have had their fling. It is a stable community, and one which is immune against invasion by other tree species save through some outside agency such as fire, logging, ice-break and the like. Given freedom from such extraneous meddlings, the true climax will occupy the ground indefinitely, reproducing itself, by its own seed, beneath its own shade.

The study of these vegetative successions belongs in the field of plant science. Forest ecology is perhaps the correct title for what I am seeking to bring out. We know but little about it as yet, and we have made some rather terrific errors in judgment. Possibly one of the greatest of these was the belief, held for some years, that the old-field white pine stands in central New England were true climaxes. We went gaily ahead, planting little white pines on abandoned fields and believing fondly that we were setting the stage for handsome cash returns for somebody. But our plantings began to develop a haggard appearance. Various bugs decimated them; fungi made malignant inroads; and the soils acquired an unhealthy color, plus a degree of compactness and dryness that gave us an uneasy feeling. And many of our trees were spindly, thin-crowned, sickly specimens, holding little or no promise of making the valuable sawtimber we had envisioned. A number of heads were thoroughly scratched over this situation; and it was the late Professor R. T. Fisher, director of the Harvard Forest, who fathered the doctrine of working in harmony with Nature. "Find out what she is trying to do and help her along" was his phrase.

These natural pine stands, so common in New England, were proven by him actually to be rather long-lived, temporary associations, occupying over their life span what was really hardwood country. I imagine it was the commonness of these patches of "cabbage pine" that made us regard them as climaxes. Possibly this belief was further crystallized by the practice, then current in Germany, of establishing coniferous plantings on nearly every square inch of the Fatherland.

Two-storied forest with oak above, beech below. Beech was planted to keep soil from drying out and to shade oak trunks, thus preventing side sprouts

It is an old New England saying that "if you cut pine you'll get hardwoods." We all knew this, yet we regarded these broadleaved interlopers as a confounded nuisance. What right had they to swarm in and choke out our precious pine plantations? But as we began to put two and two together, and to forget to some extent what was being done abroad, we realized that Nature prefers to have hardwoods growing on certain soil sites, and she proposes to see that this condition comes about. If you seek to run counter to her desires, you are simply hoarding up a future supply of headaches for yourself. It is far better to scrutinize the conditions on the ground and then try to improve these along the lines that Nature wants to follow.

For example, if you possess what was once a pasture but which is now well stocked with the primary association and is beginning to show evidence of preparing to shift over to the next step in the vegetative succession, why not aid Nature by cutting out such members of the primary community as are obviously about to wink out anyway? Seek to release the crowns of those thrifty members of the incoming association. Nature, if left unassisted, will in time completely remove the first crop. But she is a slow worker. An occasional Saturday afternoon or Sunday morning with the ax or machete will work wonders with your woodlot. It will help your figure, too.

Obviously, to do this with success, you must be able to recognize promptly the place of each species in the succession series. This knowledge can be acquired without any particularly direful amount of study. Your textbooks will be the woods themselves. Simply sharpen your curiosity and keep your eyes open as you stroll about. If you are truly interested, you will find that you are developing a curious feeling of intimate familiarity with your trees. You will come to realize that they possess likes and dislikes quite like human beings. They are a bit fussy about where they grow; if the conditions don't suit them, they will sulk. And they are

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Wood Chemistry Enters a New Age

(*From page* 59)

been deemed feasible to substitute a hog, an elevator and a bin for the usual waste carrier and burner, thus preparing the material at the sawmill for easy handling and storage. It is anticipated that upon its arrival, the material will be promptly handled through a regrinder to the alcohol plant.

With all known factors considered, costs per gallon of finished alcohol have been estimated in a very preliminary way. Raw material and conversion costs amount to under fourteen cents a gallon, allowing two dollars a ton of dry wood at the alcohol plant. Overhead costs depend upon rates of amortization. These cannot be calculated as yet but should not increase costs beyond the level of peacetime alcohol prices.

The War Production Board is giving serious consideration to the necessity for the establishment of plants for the manufacture of ethyl alcohol from wood waste. It is true that there are adequate facilities for the production of war requirements in alcohol provided the necessary amounts of raw materials are furnished the plants now existent. However, these raw materials are food and feed stuffs, and a choice must be made.

In the present situation, the country's needs for alcohol, as interpreted by the WPB, will determine the magnitude of facilities to be installed. There is no reasonable limit to the amount of alcohol that could be produced from waste wood within the total national alcohol budget, but it is apparent that there are several levels of economy of production, dependent upon the availability of waste.

On the first level, of course, is the waste from large concentrations of milling capacity. As collections of wood reach out to smaller and more distant mills, raw material costs at the alcohol plant become higher. Therefore, a great deal of softwood milling waste is relatively inaccessible as compared to that from the large concentrations of mill capacity. Beyond that, one can visualize reaching out and getting the logging waste and finally the cull timber. But the emergency would have to be great to warrant such an expenditure of manpower under present conditions.

This brings up the matter of the probability of survival of these facilities into peacetime. It has seemed wisest to consider the establishment of facilities only at the most economic spots where raw material collection will entail the least possible expenditure of manpower and transport facilities. The survival of these facilities in postwar competition will be dependent upon several factors, the most important of which will be the matter of the demand for alcohol. If the synthetic rubber industry continues, it will use as its raw material probably either alcohol or petroleum, or the national interest may dictate the use of both. There is still another source of synthetic rubber being developed during the war, but not yet in industrial production. This is the fermentation of sugar to 2, 3-butylene-glycol and the manufacture of butadiene and rubber from this material. Given cheap sugar, many engineers believe that this process will eventually be the cheapest and most satisfactory method for the production of synthetic rubber. Whether it be alcohol or 2, 3-butylene-glycol, the base is cheap sugar. If wood sugar is sufficiently cheap, its use will be found economically desirable.

The cheapness of wood sugar depends upon the fact that it is made from very cheap raw material, and that it is used for conversion to secondary products at the point of origin without going through expensive refining or having transport charges placed upon it. Its cheapness further depends upon successful utilization of the lignin produced as a by-product of hydrolysis. From each ton of dry wood there will be obtained up to 600 pounds of lignin, a clean, brown powder that seems to offer many opportunities for chemical utilization.

If a profit of one cent a pound could be obtained from lignin, the lowering of alcohol costs by ten cents a gallon would become possible. This cannot take place, however, unless outlets for lignin are developed that will require hundreds of tons, an outlet that will take most of the lignin produced. Such an outlet will come under the head of mass chemical utilization.

Early work at the Forest Products Laboratory has shown possibilities of conversion of lignin to chemical products, mixed phenols and methyl alcohol, for which mass outlets are available. Methyl alcohol is manufactured into formaldehyde. The phenols recovered from the hydrogenolysis of lignin ought to be convertible into materials capable of being used in plywood manufacture, in lamination, or in other fields requiring thermosetting, water-proof glues. There are also produced in hydrogenolysis an array of other chemical substances with which we are only beginning to be familiar and for which uses have yet to be developed. It has been the history of chemical industry that when a good, clean chemical product becomes available in tonnage lots, uses are developed for it rapidly. There is great hope for the conversion of lignin to chemicals and chemical derivatives that will take large tonnage.

These are merely indications of a strong probability that the wood hydrolysis industry will be found capable of producing alcohol or other fermentation products of sugar at a price below that of any competing material. It is not yet at that stage. At the present, it can only be said that alcohol from wood sugar will probably be found to be competitive with alcohol from blackstrap molasses. There are many uncertain factors in this competition. For example, many men believe the give-away prices for blackstrap molasses that obtained before the war will no longer obtain after the war. Be that as it may, if the synthetic rubber industry demands alcohol at anything approaching the rate now required, blackstrap cannot produce the necessary volume. A supplementary source will have to be found.

So, in the long run, we may contemplate a chemical engineering industry based upon wood, an industry producing from its own waste materials such as phenol and formaldehyde or other plastics, that can be incorporated into secondary manufacture of its own products, lumber and veneer. This is what is meant by integrated utilization.

The lumber industry has within its power the development of such an industry. If it does not exercise the power given it by ownership and control of the raw material resources and the facilities producing the waste pile, somebody else will do the job, once the opportunities for success are soundly established. The forest products industries can hire chemists and chemical engineers to run their chemical business. In fact, they will have to do this. But if they want to be comfortable and not be bothered by the continuous necessity of deciding whether this or that or the other product will pay its way, they should not embark in the chemical industry. There will always be something new coming up. Chemists and chemical engineers are a restless breed whose principal function in life is to take sow's ears and make from them silk purses. They are never comfortable in the presence of an unutilized waste product, and they will cost money. Occasionally they will produce a process or product that will make money—ten times or a thousand times more than it cost to develop the process or product. So, research and development along these lines requires brains and patient capital and confidence in the ability of that combination to turn waste piles into useful goods.

THIRD WARTIME FIRE CAMPAIGN

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THE 1944 Wartime Forest Fire Prevention Campaign, planned by the War Advertising Council's Task Force, and conducted by the U. S. Forest Service and state forest agencies, will get under way early in February. Highlighting the new drive—the third since Pearl Harbor—will be material built around two new and graphic posters shown on this page. One was prepared by the Council, the other contributed by Walt Disney. This material, as in former years, will be broadly circulated throughout the country in the form of posters, envelope stuffers, and cards. Streetcar advertisements, billboards and newspaper and magazine advertisements will be other channels of developing public interest.

The campaign will open in the South and East in time for the early spring fire season, moving westward in advance of the summer fire months. Its major purposes will be to stimulate greater public interest and participation in forest fire prevention to relieve the million man-hours tied up yearly in fighting forest fires; to reduce actual and potential damage to such critical war materials as timber and feed for cattle and sheep; to protect watersheds that are vital to power and irrigation; and to eliminate the danger of forest fire to military establishments and war industries.

Although campaign plans had not been announced at the time of going to press, it is believed that they will follow closely those of 1943, when 22,000,000 pieces of fire prevention literature—one to every six people in the country—were distributed. In addition, more than 5,000 billboard posters flashed warnings along the highways of thirty states, and 40,000 cards were placed in street cars, buses and in store windows.

Another phase of the campaign covered radio programs, motion pictures, newspaper cartoons and newspaper and magazine advertisements. Such popular radio features as "Country Journal" and "Truth or Consequences" gave nationwide appeal to the campaign. The Motion Picture Industry's War Activities Committee sponsored the showing of fire prevention trailers at commercial theaters. Nearly 700 newspapers published more than 1,000 campaign advertisements, fifteen percent of them full page, twenty-six percent a third of a page. Also, special window displays featuring fire prevention in connection with the campaign were widely used. As an example, a special display appeared in most of the 1,600 J. C. Penney stores for a full week.

The governors of twelve states, in connection with the campaign, issued special wartime forest fire prevention proclamations in 1943. Thirty state foresters acted as coordinators for the distribution of material. Other cooperating agencies included the Office of War Information, War Food Administration, the Tennessee Valley Authority, and the federal Treasury, War, Agriculture and Interior Departments. R. F. Hammatt is director of the campaign.

CONSERVATION IN CONGRESS

On January 10, the President submitted to Congress a proposed budget of federal expenditures for the fiscal year beginning July 1, 1944, the major conservation items of which are tabulated on this page. As will be noted, comparison of totals for the Departments of Agriculture and Interior, responsible for the great bulk of federal conservation activities, reveals a considerable recommended decrease for Agriculture and some increase for Interior.

The decrease in the Department of Agriculture total comes chiefly from the elimination of the $13,000,000 emergency rubber (guayule) project item and a decrease of $1,300,000 in the item for regular and emergency fire appropriations to be expended in cooperation with the states under the Clarke-McNary law. There were, however, slight increases in various other items, notably in forest research and some forest insect and disease items.

The $5,000,000 item for forest fire protection allows expenditure not to exceed $1,000,000 for emergency protection on war critical areas without matching by the states. As for the emergency rubber project, the Forest Service is expected to have approximately $5,400,000 of unexpended funds which, unless Congress directs otherwise, will be available for use on the project during the next fiscal year. The total for farm and other private forestry cooperation, split between the Forest, Extension, and Soil Conservation Services also was increased slightly, the increase going to the Forest Service. The white pine blister rust control item, which is also split between the various departments of Agriculture and Interior, was increased by approximately $750,000. The approximately $2,000,000 increase in the Interior Department conservation budget is fairly well distributed among different bureaus and items.

The President's budget will soon go before the House Committee on Appropriations and many items may be changed before it emerges on the floor of the House.

Action on three important forestry measures was expected by the House early in January but has been postponed to the current month. These bills are S. 45, to increase authorized appropriations for cooperative forest fire protection; S. 250 (H. R. 1621), to promote sustained yield forest management; and H. R. 3848, to increase and extend authorization for the Forest Survey.

CONSERVATION IN THE 1944-1945 BUDGET

Appropriation and Project	1945 Budget	1944 Appropriations or Expenditures
Department of Agriculture		
Forest Service	$29,381,408	$43,044,334
General Administration	625,000	563,670
National Forests (Total)	19,494,688[1]	19,171,216[1]
General Management	5,994,077	5,994,077
Maintenance of Structures	930,659	930,659
Fire Control	6,771,386	6,771,386
Forest Pest Control	109,674	109,674
Timber Sales	2,361,900	2,013,428
Grazing Administration	497,795	497,795
Wildlife Protection	91,086	91,086
Policing	161,496	161,496
Land-use Management	520,226	520,226
Water-use Management	25,706	25,706
Improvement Constructions	79,096	79,096
Planting and Plantation Care	186,325	186,325
Services for Other Agencies	600,000	600,000
Fighting Forest Fires	100,000	100,000
Land Acquisition	75,000	100,000
Roads and Trails	990,262	990,262
Cooperative Work (Total)	5,781,466	7,046,168
Fire Suppression (Clarke-McNary)	5,000,000	6,300,000
Forestry Cooperation	781,466	746,168
Research (Total)	2,148,254	1,880,280
Forest Management	453,848	400,000
Range Investigations	288,475	250,000
Forest Products	1,077,519	940,280
Forest Survey	156,246	140,000
Forest Economics	85,404	75,000
Forest Influences	86,762	75,000
Emergency Rubber Project	.....	13,048,000
Naval Stores Investigations	112,100	115,100
White Pine Blister Rust Control	1,219,900	1,219,900
Forestry in Other Agricultural Bureaus (Total)	2,008,941	1,966,451
Bureau of Entomology and Plant Quarantine		
Gypsy and Brown-tail Moth Control	409,320	350,000
Dutch Elm Disease Eradication	300,000	333,330
Forest Insects	172,000	150,000
Blister Rust Control	840,953	839,953
Soil Conservation Service		
Private Forestry Cooperation	146,788[2]	146,788[2]
Extension Service		
Private Forestry Cooperation	108,380[2]	108,380[2]
Bureau of Plant Industry		
National Arboretum	31,500	38,000
Total Agricultural Department	31,390,349	45,000,785
Department of Interior		
Grazing Service (Total)	1,876,434	1,715,265
General Administration	1,081,000	866,700
Range Improvements	125,000	75,000
Leasing Lands	9,000	9,000
Soil and Moisture Conservation	537,626[3]	555,052[3]
Fire Protection (Forests)—Natl. Defense	123,808[3]	209,513[3]
General Land Office (Total)	795,893	818,232
Forest Fire Protection—Alaska	33,900	29,500
Forest Fire Protection—National Defense—Alaska	111,590[3]	149,100[3]
White Pine Blister Rust	55,546	55,546
O and C Lands—Administration and Protection Including Emergency Fire	407,691	405,546
Soil and Moisture Operations Public Lands	106,997[3]	110,040[3]
Range Improvements Outside Grazing	50,000	36,500
Fire Protection—Public Lands	30,169[3]	32,000[3]
Bureau of Indian Affairs (Total)	1,310,055	1,232,920
Administration of Forests	524,000	412,500
Timber Sale Expenses	180,000	140,000
Forest Fire Suppression		
Regular	12,000	12,000
National Defense	114,035[3]	173,400[3]
Blister Rust Control	21,955	21,955
Soil and Moisture Conservation	458,065[3]	473,065[3]
National Park Service	4,830,805	4,053,310
Fish and Wildlife Service	7,363,300	6,610,390
Office of Fishery Coordination	300,000	175,000
Total Interior Department	$18,306,487	$16,333,317

[1]Owing to administrative transfers items under these headings do not correspond to the total.
[2]Included with Forest Service item under this head. Totals for these items are: 1945, $1,036,634 and 1944, $1,001,336.
[3]Allotted from main item of same name marked Total.

American Forestry Association Elects 1944 Officers

IN THE annual election of officers of The American Forestry Association, held by letter ballot of the membership during December, W. S. Rosecrans of Los Angeles, California, was reelected president, and William B. Greeley of Seattle, Washington, was reelected to the Board of Directors to serve a five-year term. Three new directors were elected to the Board: Walter H. Meyer, associate professor of forestry, Yale School of Forestry, New Haven, Connecticut, and Louis Bromfield, author-and agriculturist, Lucas, Ohio, for five-year terms; and Henry P. Kendall, manufacturer and member of the New England Council, Boston, Massachusetts, for a two-year term. I. J. Roberts, assistant vice-president of the Riggs National Bank, Washington, D. C., was elected treasurer.

Twenty-one vice-presidents were elected as follows: Thornhill Broome of Illinois, Izaak Walton League of America; Victor M. Cutter of New Hampshire, former chairman, New England Regional Planning Commission; J. N. Darling of Iowa, honorary president, National Wildlife Federation; Colonel Arthur F. Fischer of Washington, D. C., advisor, Natural Resources, Philippine Islands; Mrs. T. M. Francis of Alabama, chairman of conservation, General Federation of Women's Clubs; Mrs. Luis J. Francke of New York, chairman, Conservation Committee, Garden Club of America; Major John D. Guthrie of Virginia, American Forest Fire Medal Foundation; Edmund Hayes of Oregon, chairman, Keep Oregon Green Association; Paul G. Hoffman of Indiana, chairman, Committee for Economic Development; Augustus S. Houghton of New York, New York State Reforestation Commission; Don P. Johnston of North Carolina, manufacturer.

Irving H. Larom of Wyoming, president, Dude Ranchers' Association; Aldo Leopold of Wisconsin, Wilderness Society; Glenn L. Martin of Maryland, president, League of Maryland Sportsmen; Duncan McDuffie of California, president, Sierra Club; Julian McGowin of Alabama, director, Southern Pine Association; James G. K. McClure of North Carolina, president, Farmers Federation; Mrs. George D. Pratt of New York; Dr. Henry Schmitz of Minnesota, president, Society of American Foresters; Harper Sibley of New York, vice-chairman, United Service Organizations, Inc.; and Lowell Thomas of New York, radio commentator and author.

Federal Bureaus Outline Postwar Conservation Programs

POSTWAR conservation policies and programs were discussed at Washington late in January in a three-day conference called by national conservation organizations. Here are the highlights:

Secretary of Agriculture Claude Wickard asked for a program putting all land resources on a sustained-yield basis. Such a program does not now exist, he said, pointing out that a third of the nation's crop land has been damaged by erosion, that the capacity of range grazing lands has been cut in half, and that forests are being cut faster than they are growing. He expressed the hope that it will not be necessary for the federal government to regulate the use of private land.

Secretary of the Interior Harold Ickes sensed a strong movement to cripple conservation by wholesale transfers of federal conservation lands to the states. Both he and the President, he declared, hoped that conservation groups would fight to hold what has been gained.

Lyle Watts, chief of the Forest Service, stated that forests are being overcut by fifty percent, that too much young timber is being harvested, and that present woods operations are, in many cases, not conducive to establishing new forest growth. He outlined a forest conservation program featuring public regulation of cutting on private forest lands along the lines of a federal law setting minimum standards which the states would be expected to adopt or raise.

Dr. Ira Gabrielson, chief of the Fish and Wildlife Service, predicted a great increase in hunting and fishing after the war, but expressed a belief that game populations would be in condition to meet the demand. In anticipation of an immediate postwar employment slump, he proposed a wildlife development program which would attack stream pollution and advance land management for wildlife. He also advocated a wildlife extension program to work with landowners, and the completion of the federal wildlife refuge system.

Director Newton Drury of the National Park Service, looked to greatly increased travel after the war and demand for airport facilities on or near national parks. As to this development, he advocated a conservative approach. A postwar park development program, he said, should also be conservative; nor should the park acquisition program be large, except for acquiring interior holdings in existing parks.

Joseph H. Leach, assistant director of the Grazing Service, advocated a postwar program of range improvement to increase the livestock capacity of the public ranges. He also called for a land purchase program to acquire critical areas now in private ownership. Such areas, he said, are needed to round out economic grazing units.

G. G. Bennett, chief of the Soil Conservation Service, pointed out that there probably would be no great area of land put under emergency cultivation in this war. Increased food production is coming from better tillage of lands now in cultivation. As to the postwar period, he declared that his department was prepared on short notice to put 200,000 men to work on soil conservation activities.

CONSERVATION CALENDAR

Important Bills in Congress With Action—January 10-24, 1944

Governmental Functions

S. 1662—BREWSTER—To amend the Selective Training and Service Act of 1940, as amended, to defer registrants engaged in timber or pulpwood logging operations. Introduced January 24, 1944. Referred to the Committee on Military Affairs.

National Forests

S. 1618—THOMAS, Utah—To amend the Acts of August 26, 1935 (49 Stat. 866), May 11, 1938 (52 Stat. 347), June 15, 1938 (52 Stat. 699), and June 25, 1938 (52 Stat. 1205), which authorizes the appropriation of receipts from certain national forests for the purchase of lands within the boundaries of such forests, to provide that any such receipts not appropriated or appropriated but not expended or obligated shall be disposed of in the same manner as other national forest receipts, and for other purposes. Introduced January 11, 1944. Referred to the Committee on Public Lands and Surveys.

Water and Stream Control

H. R. 3961—MANSFIELD, Texas—Authorizing the construction, repair and preservation of certain public works on rivers and harbors, and for other purposes. Introduced January 13, 1944. Reported without amendment (No. 1000) by the House Committee on Rivers and Harbors January 19, 1944.

Foresters Reelect Dr. Henry Schmitz

DR. HENRY SCHMITZ, dean of the College of Agriculture, Forestry and Home Economics, University of Minnesota, has been reelected president of the Society of American Foresters for the two-year term 1944-1945. Prior to his becoming president in 1942, Dr. Schmitz had been editor-in-chief of the JOURNAL OF FORESTRY, the official organ of the society.

Professor Shirley W. Allen of the School of Forestry and Conservation, University of Michigan, Ann Arbor, was reelected vice-president. A former officer of the U. S. Forest Service, later forester for The American Forestry Association, he has been professor of forestry at Michigan since 1928.

These officers, together with nine additional members, constitute the Council which is the governing body of the society. Elected to the Council were the following foresters:

Ralph C. Hawley, professor of silviculture, School of Forestry, Yale University; A. B. Recknagel, area forester for the Timber Production War Project, Albany, New York, formerly professor of forest management, Cornell University; Dr. Hardy L. Shirley, director of the Allegheny Forest Experiment Station, Philadelphia; Walter J. Damtoft, assistant secretary, Champion Paper and Fibre Company, Canton, North Carolina; Jay H. Price, regional forester, U. S. Forest Service, Milwaukee, Wisconsin; Professor Frederick S. Baker, Department of Forestry, University of California, Berkeley; William B. Greeley, secretary-manager, West Coast Lumbermen's Association, Seattle, Washington; F. Paul Keen, forest entomologist, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Berkeley, California; and Glen A. Smith, formerly assistant regional forester, now retired, U. S. Forest Service, Missoula, Montana.

In addition to the foregoing officers, three nationally known foresters were elected Fellows of the Society of American Foresters. Election to the grade of Fellow is in recognition of outstanding achievement, and is the highest honor that can be accorded a forester in the United States. They are:

Dr. Henry Schmitz

Edward Gheen Cheyney, professor of silviculture, Division of Forestry, University of Minnesota. The author of forestry textbooks and a contributor to technical periodicals, he has been on the forestry faculty at Minnesota for thirty-eight years.

James W. Girard, U. S. Forest Service, Washington, D. C. A former logging and sawmill operator, he has been a forest engineer for the Forest Service for thirty years, and since the war has been a consultant to the War Production Board.

Gilmour B. MacDonald, head of the Department of Forestry, Iowa State College, and state forester of Iowa. He has been engaged in forestry education for thirty-three years, and in state forestry administration for twenty-five years.

Let's Get the Facts

WITH YOUR HELP WE WILL!

We do not know what effect the war is having on our Forest Resources—but with your help we will find out.

As a contribution to postwar reconstruction, The American Forestry Association has formally inaugurated a national appraisal to determine the war's effect upon the country's forests and forest lands.

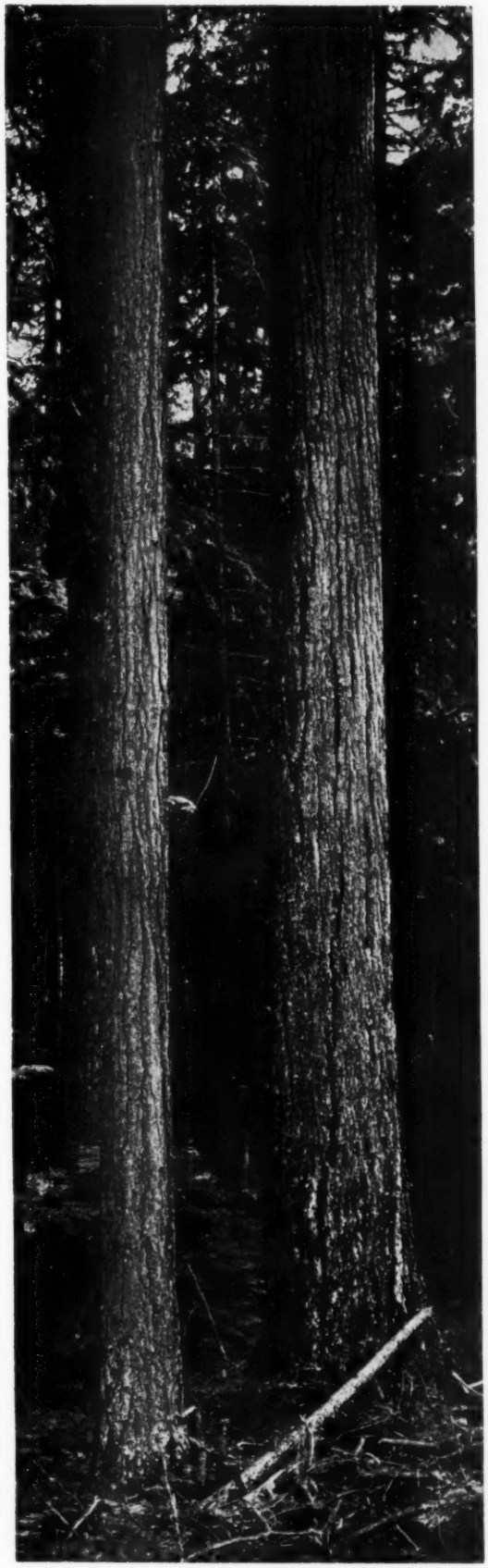
IMPORTANT? It's the most important conservation job that needs doing.

WHY? When the war has run its course and reconstruction is at hand, conservation must present an informed—not an "I don't know"—front in respect to forest conditions if it is to have and to hold its rightful place in shaping our postwar American economy.

HERE is a joint responsibility of all conservation interests—public and private alike—in preparation for the war's end when our boys will be coming back and like us on the home front will want conservation to have a factual, realistic and sound foundation upon which to build our country's future.

SO, let's make it a joint undertaking. The Association's project now starting offers you this opportunity. Additional underwriting is necessary. The goal is $250,000—two-thirds of which has now been promised. We invite your help in the financing. Do it now with a cash contribution, a pledge, or, as a number have done, buy a Series F or G War Bond in the name of The American Forestry Association and mail it to us.

THE AMERICAN FORESTRY ASSOCIATION
919 17th Street, N. W.
Washington 6, D. C.



TREE EXPERTS MANUAL, by Richard R. Fenska. Published by A. T. De La Mare Company, Inc., New York, 1943. 192 pages, illustrated, index. Price, $4.50.

This book packs a great deal of useful information into small compass. An owner of shade trees would do well to read carefully a book such as this before starting out to do tree work on his own trees. He might even do well to read it before hiring someone else to do the work. He would then understand what is to be done and why.

The book opens with a discussion of how trees grow, the factors affecting their growth and the nature of their ailments. Well organized chapters on tree care, fertilizing, transplanting, pruning, surgery, disease and insect control follow. The chapters on evaluation of shade trees and shade tree laws are sketchy but probably those of least concern to the average tree owner.

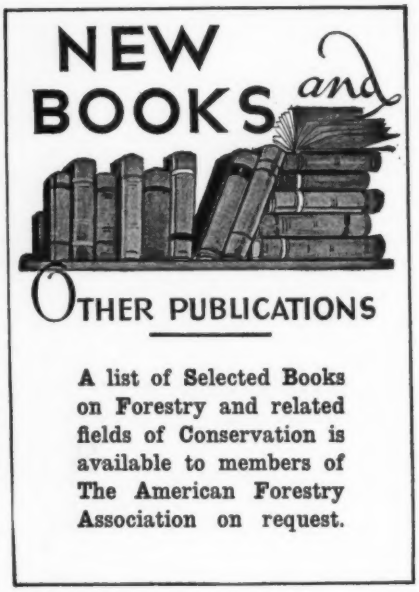
The reviewer protests the author's invention or endorsement of the term *dendrician* used to describe the highly intelligent, well trained, and physically able young men who climb to the highest limbs to prune, spray and otherwise treat shade trees. Doubtless these high climbers deserve a name of their own, but one derived from ancient Greek is out of keeping. How about *treejacks* instead?

TAXIDERMY, by Leon L. Pray. Published by The Macmillan Company, New York City. 91 pages, illustrated. Price $1.49.

Taxidermy is a fascinating hobby, as well as an established profession and the author has directed this new edition of his book to the hobbyist rather than the professional, whose keen zest is necessarily dulled by the rush of production. Full information is given the beginner, from the assembling of his shop, tools and materials to the preparation and mounting of specimens, and it is well illustrated with clear drawings by the author.

J. STERLING MORTON—Pioneer Statesman, Founder of Arbor Day. By James C. Olson. Published by the University of Nebraska Press, Lincoln, Nebraska. 451 pages, illustrated. Price $3.50.

This is a biography, not only of a man but of an era in our Middle West, for it covers the life and times of Nebraska's great pioneers. Morton was one of the progressive-minded, who saw beyond his day the tremendous agricultural possibilities of the State, and who worked ceaselessly for their development. His love of trees culminated in the establishment of Arbor Day, now celebrated by nationwide tree-planting, —an idea he gave the world. Finding Nebraska practically a treeless prairie, by his enthusiasm and tireless effort in urging planting, he left it a place of beauty filled with fruit farms and tree-shaded homes. Active in politics, editor, writer and builder, he became governor of the then territory and eventually Secretary of Agriculture in the Cleveland Cabinet. In writing this book Mr. Olson had access to previously inaccessible private documents, and it is a well rounded biography, annotated, complete and definitive.



BIOGRAPHY OF THE EARTH—Its Past, Present and Future. by George Ganow. Published by The Viking Press, New York City. 242 pages, illustrated. Price, $3.00.

This story of the earth's career is written by a scientist of high repute. in the manner of a human biography. He tells of its birth, as gaseous, molten matter torn away from the young Sun, its father and mother, its nine brother planets, its deep-rooted mountains, its scar left when the moon was born, the great events of its life during which the cosmic existence of man evolved and developed, to the final curtain when earth will be destroyed by melting in the last desperate explosion of the old dying Sun. A book to read with confidence in its authority and delight in its content.

WITHIN MY GARDEN WALLS, by Georgia Squires Whitman. Published by The Tool Shed, Bedford Village, N. Y. 165 pages, paper bound, illustrated. Price, $1.00.

This is a book written for all—professional or amateur—who love, and work in, gardens. In telling how one enchanting American garden came into being, the author gives endless practical suggestions as to procedure in creating others of equal charm. She refutes the fallacy of the well-known "green thumb" and says frankly that the secret of success is *labor*,—"dig deep, plant firmly, water thoroughly, fertilize freely, cultivate frequently—these are the essentials." Gardeners, listen and learn.

Appraisal Project

(*From page* 73)

Feasterville, Bucks County, Pennsylvania.

New Connecticut Chapter, Daughters of the American Revolution, Painesville, Ohio; F. E. Norman, San Francisco, California; and North Carolina Pulp Company, Camden, New Jersey.

C. H. Ohlwiler, Southbridge, Massachusetts.

Mrs. Frederick Pabst, Oconomowoc, Wisconsin; The Parker-Young Company, Lincoln, New Hampshire; Mrs. H. E. Parks, Trinidad, California; and Mrs. H. May Pearsall, Eureka, California.

Lawrence W. Rathbun, Concord, New Hampshire; Rayonier, Inc., Seattle, Washington; Mabel C. Rhoades, Syracuse, New York; Rhinelander Paper Company, Rhinelander, Wisconsin; Riegel Paper Corporation, New York City; Cathryn V. Riley, Patchogue, New York; and P. W. Robbins, East Lansing, Michigan.

St. Regis Paper Company, New York City; William R. Sachse, Wilmette, Illinois; L. H. Schildering, Cincinnati, Ohio; Mrs. Frank Seinsheimer, Sr., Cincinnati, Ohio; Miss Ruth Sener, Lancaster, Pennsylvania; Miss Lilian M. Simonds, Milwaukee, Wisconsin; Miss Henrietta W. Slicer, Baltimore, Maryland; Dennis V. Smith, Long Beach, California; Ned A. Smith, Corpus Christi, Texas; Southport Corporation, Inc., New Orleans, Louisiana; Frank H. Speese, Ontonagon, Michigan; and Henry B. Sutphen, East Orange, New Jersey.

Arvid Tesaker, Traverse City, Michigan; and Dr. D. L. Tilderquist, Duluth, Minnesota.

Union Bag and Paper Corporation, New York City.

C. F. Walker, Cleveland, Ohio; Elsa Werner, Philadelphia, Pennsylvania; West Coast Plywood Company, Aberdeen, Washington; Frederick H. Wiegman, Alvarado, California; Wisconsin Land and Lumber Company, Hermansville, Michigan; John B. Woods, Washington, D. C.; and Edward Woolman, Haverford, Pennsylvania.

A. G. Zimmerman, New York, N. Y.

Living Communities

(*From page* 77)

particular about their associates. If they don't care for the company they will often express their displeasure by simply dying out of hand.

After you have become acquainted with some of their chief idiosyncracies, you will find them to be right good companions. They are not garrulous; if you are fortunate in your approach you will find yourself developing a feeling of sympathy and understanding which will make it possible for you to have a delightful time just sitting on a stump, by yourself, and studying the composition of the surrounding forest and trying to piece together how it came about. So much of our eastern woodland has been cut, or burned, or both together, that the effect of these outside influences has often produced a confusing mixture the life-history of which offers a fascinating problem.

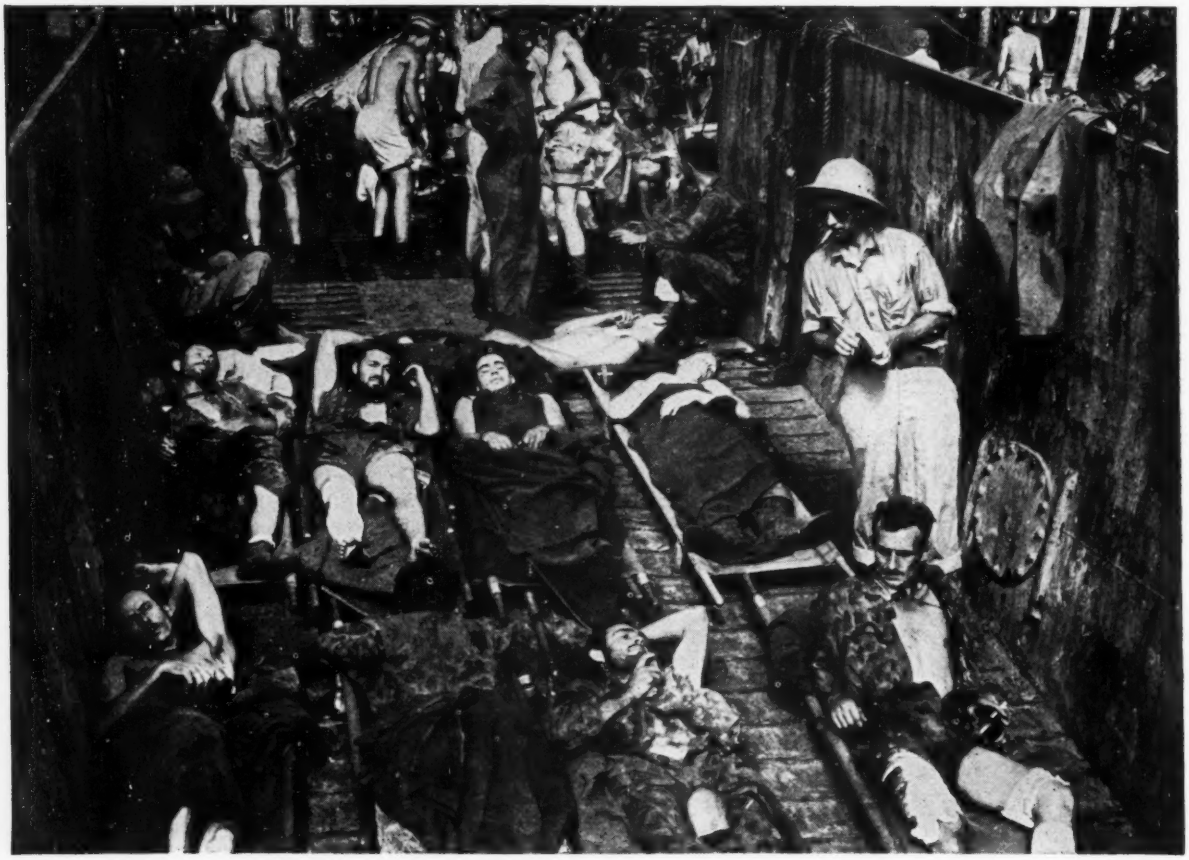
If you are a woodland owner, or perhaps an apartment-dweller who is fond of the woods, try looking at them with the eyes of the ecologist. You will find it much more than just a fanciful hobby.

Wood Waste

(*From page* 75)

determined origin. These turned out to be stains. Cinders settling on the uppermost veneer sheet during shipment were responsible. To the man who unloaded the carload such an explanation might have been obvious. The inspectors who later saw the discoloration thought it was decay. However, they were distinguished from decay flecks by their broadcast distribution, their occurrence on only one side of the sheet, and their purely surface character as demonstrated by light scraping.

Plywood companies furnishing aircraft veneer rightly rejected much discolored stock on the assumption that its off-color indicated decay. Victory and human life depends on the strength of the wood in a plane. They now can substitute scientifically derived criteria for suspicion. Today inspectors carry in their pockets actual specimens, prepared by the pathologists, conveniently mounted in sets. With these available a harmless stain can quickly be distinguished from a weakening discoloration. Waste piles are shrinking and aircraft are rolling off the assembly lines faster than ever. Once more men of science have teamed up with men of industry in a truly American combination.



Pin-up picture for the man who "can't afford" to buy an extra War Bond!

YOU'VE heard people say: "I can't afford to buy an extra War Bond." Perhaps you've said it yourself . . . without realizing what a ridiculous thing it is to say to men who are dying.

Yet it *is* ridiculous, when you think about it. Because today, with national income at an all-time record high . . . with people making more money than ever before . . . with less and less of things to spend money for . . . practically every one of us has extra dollars in his pocket.

The very *least* that *you* can do is to buy an *extra* $100 War Bond . . . above and beyond the Bonds you are now buying or had planned to buy.

In fact, if you take stock of your resources, and check your expenditures, you will probably find that you can buy an *extra* $200 . . . or $300 . . . or even $500 worth of War Bonds.

Sounds like more than you "can afford?" Well, young soldiers can't afford to die, either . . . yet they do it when called upon. So is it too much to ask of us that we invest more of our money in War Bonds . . . the best investment in the world today? Is that too much to ask?

Let's all BACK THE ATTACK!

WE BOUGHT EXTRA WAR BONDS
4TH WAR LOAN

AMERICAN FORESTS MAGAZINE

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

Fire and Pines

(*From page 64*)

1920 it was followed by complete failure. Hardly a seedling came out of the grass, and those surviving died eventually. The explanation is defoliation—annual defoliation in the *absence* of fire.

One is tempted to quote "God moves in a mysterious way his wonders to perform." Why, for instance, is the longleaf pine susceptible to a leaf disease known as the brown spot which, *in the absence of fire*, becomes so prevalent that it strips the seedlings of their needles as effectively as fire itself? For one thing, we have learned at Urania that where all conditions are favorable for seeding, the crop of seedlings is enormous and competition is so fierce that all are badly stunted, the period required for their emergence from the grass is greatly prolonged, and only a few ever pull through. Brown spot, therefore, acts as a powerful, unregulated, thinning agency in the absence of fire, but an inefficient one. It is strictly uneconomical and dangerous. Its best effect is found where its advent is postponed by previous fires and absence of reproduction to the period following the beginning of height growth. When it becomes epidemic at this time it may kill from fifty to ninety-five percent of the seedlings one to three feet high, leaving the stronger ones to survive and benefit from the thinning. But this peculiar effect may remove from the stand an entire crop of later thinnings otherwise available for pulpwood, leaving only from 200 to 500 dominant trees an acre. On all counts, brown spot must be controlled or eliminated.

It happens that when fire destroys all the needles in a young stand, which it does very effectively before the height growth starts, it also disinfects the area thoroughly, and would do so completely were it not for the fact that some of those spores manage to live on needles from six to ten feet above the ground. When these needles escape fire, the disease is swiftly re-established. In case abundant spores are so preserved, as when young stands three to eight feet high are burned over on cool winter nights and the ground cleared of grass, the infection the following spring may be unusually heavy and the smaller and weaker trees will be wiped out in the next two or three years. This phenomenon is due to the fact that when spores fall on bare soil they are distributed by splashing rain and infect everything within reach.

These rather remarkable relationships

indicate that the method for controlling brown spot is to burn the land over during the winter preceding the fall of the seed and then wait from two to three years before completely burning the land again. This second fire also kills back all competitors. If fire is again used after a second period of two or three years, depending on how fast the disease becomes re-established, the longleaf seedling, having been able to carry healthy foliage over into the second season from two to four times, retains its maximum vigor and shoots up on schedule. If longleaf pine reproduction is obtained all at once, in years of heavy seed production, as it should be, and if no advance growth of small saplings is present to carry the infection, or if the fire does succeed in defoliating these taller seedlings, complete temporary disinfection will result. This, incidentally, is one of many reasons why longleaf pine should be grown in even-aged stands. Other reasons are root competition with older trees, which kill out the seedlings over a wide radius, and the light requirements of the seedlings.

These principles of fire control and timing are not theoretical. They have been demonstrated in practice at Urania, beginning with the seed crop of 1928, and have produced a thrifty crop of saplings from seed supplied by seed trees. The only failures occurred when fire was either kept out, not used at the proper intervals, or improperly handled. The procedure is based on experience running back to 1913 and covering every variation of treatment.

The use of fire in longleaf pine cannot be confined to the seedling stage. Once the saplings have been secured, there is still a problem which must be met. It is seldom that a longleaf stand is so dense that grass, and especially bushes and shrubs of an inflammable nature, are not present in quantity. Prolonged freedom from fire may and often does build up a veritable firetrap on the ground beneath these stands. Experience at Urania has clearly shown two things: first, that summer or fall fires, if they occur, cannot be stopped short of almost complete destruction of the stand, killing not only every young tree, but the old seed trees as well; second, that under exactly the same ground conditions these stands can be burned over during winter months, at night and in favorable weather, without either killing or even defoliating the stand and without appreciable effect on its growth rate.

We have also learned that such *winter* fires, if they run with the wind, will and have defoliated every tree without killing any of them. But growth as the result of defoliation was reduced to a quarter of the normal rate, and three years were required to work back to the average for stands burned over but not defoliated. We also noted that portions of this stand which had been accidentally winter-burned at intervals of from five to eight years escaped serious injury or defoliation in subsequent winter fires, though summer fires are dangerous and probably destructive in any stand.

Owing to the long life of the longleaf pine, reaching about 300 years before wind, fire scars, bark beetles and internal decay finally remove the last of the veterans, the hit or miss operation of natural fires has sufficed for the maintenance of the species in pure, though usually rather open stands. By using these same natural factors under strict timing and intelligent control, pure stands of maximum density can be raised, which will begin to pay for themselves in pulpwood by the twenty-fifth year, in later yields of poles and piling, and eventually in lumber of high quality.

But why grow longleaf pine at all if its place can be taken by faster growing pines such as slash or loblolly? That is a fair question, and over large areas of southern Georgia and northern Florida the slash pine has successfully replaced longleaf where fires of annual or of two to three year frequency have been excluded. The fact remains, however, that nature did not operate in this way. We may and probably can replace longleaf by slash pine—much less probable for loblolly—over great areas of relatively flat lands not much different from the protected, flooded flats where slash pine seedlings were kept from burning during the first few years by water on the ground. But already it is found that the stem rust, *Cronartium sp.* to which longleaf is immune but which has scrub oaks as its alternate host, is ravaging these slash pine invaders of the uplands in the Mississippi region. It is known also that slash pine roots are spread widely on the surface without the deep penetration of longleaf. How will they survive droughts on sandy hills?

Slash pine's adaptation to fire is entirely different from that of longleaf. In its first year or two the seedling initiates height growth at once, but is killed by the least touch of fire. By its rapid growth and accompanying increase in bark thickness, it seeks to attain relative immunity quickly. In this it has remarkable success. Within three to four years a really hot fire is required to kill all the seedlings in a stand, though the weaker and smaller ones will go. Within five to six years, winter fires which do not crown will leave the stand practically untouched. But, even more than with longleaf pine, summer fires, which always crown in dense thickets, destroy the young stand utterly.

Protection of slash pine, therefore, re-

quires an initial period of exclusion of fire, followed as soon as it is safe by winter burning to remove the hazard and fireproof the stand. This practice is now so firmly established and well demonstrated in Georgia, on such holdings as the Superior Pine Products Company at Waycross, that there remains only the careful development of safe and approved methods of winter burning to insure success in growing slash pine from natural seeding.

Loblolly pine is of little importance in the deep South. It is not naturally adapted to the soils and climate, finding its best development further north on better grade soil which holds more moisture. The ground cover in typical loblolly-hardwood stands is not composed of heavy sedge grass except temporarily on old fields. The brush is not so combustible in character, and hardwood leaves reduce the inflammability of the ground-cover and litter. Fire plays a predominant role in favoring pine reproduction over hardwoods, but by contrast with longleaf or even slash pine sites, fires cannot be repeated more often than ten years apart. Otherwise, the young pines will not have had time to develop the resistance in bark or the height of crown which, after this period, enables them to survive winter fires. Hence one cannot hope to reproduce and grow loblolly pine successfully in mixture with longleaf. Either the loblolly will be killed out by the fires necessary to longleaf survival, or the longleaf seedlings will be suppressed and die under the shade of the faster growing loblolly. It follows that on sites naturally adapted to loblolly pine, on which longleaf pine may have intruded because of past uncontrolled fires, the exclusion or control of these fires will permit the growing of loblolly pine as a more profitable crop.

Large areas along the northern portion of the longleaf belt are coming up to loblolly and shortleaf pine due, primarily, to fire protection, but also to the absence of longleaf pine seed and utter failure to apply the methods needed to reproduce longleaf pine naturally. This failure is due, in turn, to past ignorance of the role of fire in growing pines—an ignorance displayed not only by settlers and farmers who practiced annual burning, but later by foresters who attempted to prohibit altogether the use of this natural agency. If as now seems possible, we can learn to use and at the same time control fires, we will continue to raise pines in the South, and the Chinese will have nothing on us in intelligence.

Elk Below!

(*From page 67*)

by the Fish and Wildlife Service and four smaller ones by the Wyoming State Game and Fish Commission.

The elk move in and out of the feed grounds at will and to avoid omissions or duplications, elk adjacent to the feed yards are aerially counted concurrently with ground counts of the feed lots. After years of experience, a practical way of counting these winter boarders has been developed. They are still wild animals, easily excited and stampede quickly. When the feed grounds are to be counted, the daily ration of about ten pounds of hay a head is hauled out and scattered in the shape of a horseshoe. As soon as the animals are settled down, the counters, working in sleighs to which the elk are accustomed, begin the count at the heel of the shoe, one sleigh moving along the inside of the circle and the other paralleling it on the outside.

Thus all elk pass between the counters who are careful not to alarm the creatures. If a number become excited and break away, the whole herd will usually follow.

With the feed grounds and vicinity counted, flights are made to all outlying ranges where elk might winter. These runs are always fascinating—magnificent scenery adding interest to the thrills of seeing wildlife struggle for existence in the snowy, mountainous region.

It is not claimed that the aerial count was one hundred percent correct. Indeed, I know of no method by which wild animals can be counted to the last head. The accuracy depends much on the personnel, the equipment, the type of country to be flown and the care with which the job is done. The pilot is the key man; he should have had much experience in mountain flying and must know what his ship can do. The "daredevil" pilot should be avoided. Experienced observers are best. The ship should be a high-winged monoplane, cabin type, amply powered, slow cruising speed and in topnotch condition. Snow is essential; new snow to cover old tracks makes it ideal. Flights should be made only in good, clear weather. It is wholly unnecessary to get caught in fogs or above the clouds. The country should be covered systematically, with no wandering around. Observance of these fundamentals will insure a good count, more accurate and cheaper in time and money than any other method yet devised.

Fred was right when he said, "It's a quick, easy way to do a hard job."

Forestry and Strip Mining

(*From page 72*)

Some of the pines have made good growth. In an eighteen-year-old planting, white pine has reached sizes up to nine inches in diameter at breast height, and from thirty-five to forty feet tall; red pine ten inches in diameter and twenty-five feet in height; and jack or Banksian pine eight inches in diameter and heights of forty feet. Younger plantations show promise of doing as well.

The present policy of the Indiana Division of Forestry is to recommend planting pines alone or in mixtures with other species, and to plant the better hardwoods in mixtures with black locust in a ratio of at least two to one favoring the latter. The hardwoods are recommended only on the better sites throughout the state.

Planting costs, according to records furnished by coal companies, average $20.00 an acre, as follows: planting stock, $6.00, labor, $12.00, and transportation and other costs, $2.00. These figures are at the rate of 1,200 trees an acre.

Valuable as will be the wood products of the strip hill forests, they will have another set of values not easily reduced to a cash basis, but of significance in the lives of Indianans. They provide recreation places for people and habitats for wildlife. This comes about in an interesting way. After an area has been mined out the last pit is left open. Usually it fills with water becoming a long narrow pond covering up to twenty-five or thirty acres. Lakes and ponds are rare and hence much prized in southern Indiana. Strip land ponds are excellent for fishing and ideal living quarters for waterfowl, muskrat, mink and beaver. The proximity of this available water supply makes the hills themselves attractive to many kinds of wildlife. After forests are established on their banks, the ponds and their environs afford recreational opportunities for boating, swimming and picnicing, as well as hunting and fishing in a part of the state that formerly had few such opportunities. The city of Linton has been given a six hundred acre tract of land which is to be developed as a municipal forest and recreational center.

Indiana feels that she has the solution to a formerly perplexing problem. Land that long ago bore forests was cleared, farmed until its fertility was gone, then torn up, stirred to yield a coal crop and is now being returned to forests.

Paulownia as a Tree of Commerce

(*From page 61*)

weight lumber field.

Many people confuse the Paulownia with the *Bignoniaceae* family, represented by our native catalpa. In fact, George B. Sudworth in his "Check List of Forest Trees," lists one of its common names as "blue catalpa." But Paulownia is in the *Scrophulariaceae* family, and the fruit is different even though the flower panicles and leaves bear some resemblance.

Introduced in 1834, the Paulownia is now common in the East as far north as New York. It is root hardy even to southern Canada. In Rochester, New York, several Paulownias are planted for the ornamental value of the huge leaves, which are characteristic of coppice growth. Some of these leaves reach thirty-eight inches in width, and one-year-old shoots twenty-one and a half feet high and ten inches in circumference have been recorded.

The flower buds of Paulownia remain on the tree for two years before blooming, but successive crops of flowers appear every year. As a consequence, the mature tree is never without flower buds. In Washington, D. C., the lilac colored panicles appear before the leaves, about the first week of May. Two weeks later when the blossoms are ready to fall, the leaf buds open. The leaves on other trees, by this time, are fully developed. The Paulownia makes up for its tardiness by retaining its foliage until late fall. Usually after the first frost, the leaves gradually drop to the ground—still green. Paulownia foliage does not turn color in the fall.

The Paulownia is a prolific seed bearer. According to R. S. Walker, whose observations were made as early as 1919, a single pod from a fruit cluster contained 2,000 tiny winged seeds by actual count; and a mature tree, he estimated, may bear a crop of over 21,000,000 seeds. No wonder these trees are springing up all over the East!

Insects and diseases do not seem to bother Paulownia. In areas where the San Jose scale is prevalent, the majority of trees are infested with it, but not the Paulownia. Heart rot may develop, but only after an injury such as the loss of a principal limb. Aside from this, the Paulownia is immune to common tree ailments.

The Paulownia will grow rapidly even on the poorest soils. Last summer, in Washington, D. C., a seed lodged in the mortar of a brick wall twenty feet above the ground, germinated and a seedling three feet long is now flourishing. The writer has observed many Paulownias growing at fairly high elevations in the Virginia Appalachians, and also in the lowlands of the deep South. In western Tennessee there are quite a number of these vigorous young trees springing up in farm woodlots. *Grown under forest conditions, the tree assumes a typical upright, slender, sawlog form, with small crown and uniformly cylindrical trunk.* It is usually seen, however, growing in the open; and like other trees under these conditions, spreads out forming a broad crown with a short crooked trunk. It will reach over four feet in diameter and sixty feet in height under favorable conditions. Japanese botanists visiting this country several years ago remarked that Paulownia grows larger in the United States than in Japan.

Paulownia offers some excellent possibilities for commercial reforestation, especially in the South where it is believed plantations of this species would provide a crop of sawlogs in from ten to fifteen years. It requires well drained soil and protection from wind, but such protection would be automatically provided by planting the year-old seedlings in closely spaced rows. The writer would suggest, as a start, rows four feet apart each way. The stand would thin itself by natural methods within a few years. After that the trees would shade out most of the grass and weeds, thus reducing fire hazard and conserving such moisture as may reach the soil.

Paulownia wood is fairly coarse grained and ring porous, with considerable strength for its weight. It glues well and resists warping, cupping and twisting to a remarkable degree. It is silvery gray, sometimes with a trace of lavender. The wood is characterized by a prominent pith, about the size of a lead pencil. Specific gravity ranges from .23 to .30 which indicates a weight of 14.37 to 18.75 pounds a cubic foot, or approximately from 1,200 to 1,560 pounds a thousand board feet. Paul-

ownia is only about two-thirds as heavy as some of the lightest commercial woods in this country. Northern white pine, for example, weighs twenty-five pounds; yellow poplar, twenty-eight pounds; chestnut, thirty pounds; and even the lightest northern white cedar, weighs twenty-two pounds a cubic foot at twelve percent moisture content.

Apparently no laboratory tests have been made in this country to determine the physical properties of Paulownia. The wood appears to be fairly tough, however, and should provide a substantial material where lightness of weight is important.

One particular use would be the manufacture of crating and boxing lumber for airplane express or freight shipments. We are on the threshold of a great aeronautical age and a large part of this business will be air freight. Weight saved means dollars saved. Where it takes thirty pounds of ordinary box lumber to crate a given object, the same container could be made with eighteen pounds of Paulownia — forty percent saving in weight and shipping expense of the container.

Another suggested use is for cores in veneer panels. In the past chestnut furnished a large portion of this stock, but chestnut is passing out of the picture. Our current chestnut lumber production is coming from dead timber, and this cannot hold out for many years. In fact, the higher grades of chestnut are almost a rarity now.

In conclusion, there is reason to believe that a reforestation program aimed at the production of a new lightweight lumber source would be worth while. Many of our lightweight wood problems might be solved by the success of such an enterprise, and the cost of planting and maintenance would be very low.

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WHO'S WHO
Among the Authors in this Issue

J. A. HALL (*Wood Chemistry Enters a New Age*)—Hoosier, took his degree in chemistry from the University of Wisconsin and for seven years was attached to the Forest Products Laboratory at Madison. Later Director of the Central States Forest Experiment Station, he is now in Washington on a special war assignment as principal biochemist for the Forest Service.

JOSEPH L. STEARNS (*Paulownia as a Tree of Commerce*) is a forest products engineer with the National Lumber Manufacturers Association at Washington. He has traveled extensively in the United States and Canada, studying trees and collecting wood specimens, of which he has over 2,300—one of the largest private collections in the country.

HERMAN H. CHAPMAN (*Fire and Pines*), pioneer forester and outstanding authority in the whole forest field, is author of over 400 publications. Prof. Chapman recently retired from active service on the faculty of the Yale Forest School, which he joined two years after graduation from that institution in 1904 and where he had occupied the Harriman chair of Forest Management since 1911.

ORANGE A. OLSEN (*Elk Below!*) is recognized as one of the best informed men in the Forest Service on big game range and wildlife management. Native of Utah, he is thoroughly at home on the ranch, at a roundup, in a hunting camp or in a plane.

SETH JACKSON (*Sequoias In Montana*) was graduated in forestry at Cornell, class of '26. He has been with the Forest Service—largely in the West—since 1933 and only recently transferred to the South.

CARL M. CARPENTER (*Forestry and Strip Mining*) is a native Indiana forester, schooled at Purdue. Connected with the State Department of Conservation since 1933, he has had a wide and valuable experience, leading to his appointment in 1941 as field administrator of the "strip mine reforestation act."

HENRY H. TRYON (*Trees As Living Communities*), Harvard forester, class of '13, has been Director of the Black Rock Forest at Cornwall-on-Hudson since 1927. Beyond induction age and having tried in vain all service avenues, as president of the local gun club "Hank" has been organizing gunnery classes, giving pre-induction training in shooting to prospective draftees.

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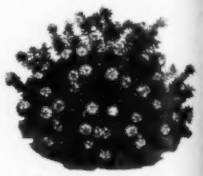
Older, ready to bear strongly next fall, we have a 5-year-old size in all but the peach. We offer 5 plants: 2 apples, 2 pears and 1 plum as above—5-year-olds—for $45.00. You may add additional varieties to the above collections, which take care of all basic pollenizing at the rate of $3.75 for each extra 2-year or $9 for each extra 5-year-old.



Daphne cneorum

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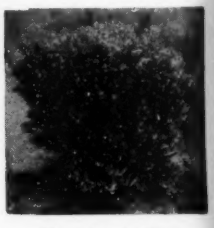

Berrybush Yew

(*Taxus media kelseyi*)

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